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Classification of Public Domain

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Land Planning and Classification Report of the public domain lands in the

BIG DRY MONTANA PUMPING AREA
MONTANA

A Missouri River Basin Investigation

For Administrative Use Only

DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
DENVER, COLORADO

March 3.

U.S. DEPARTMENT OF THE INTERIOR
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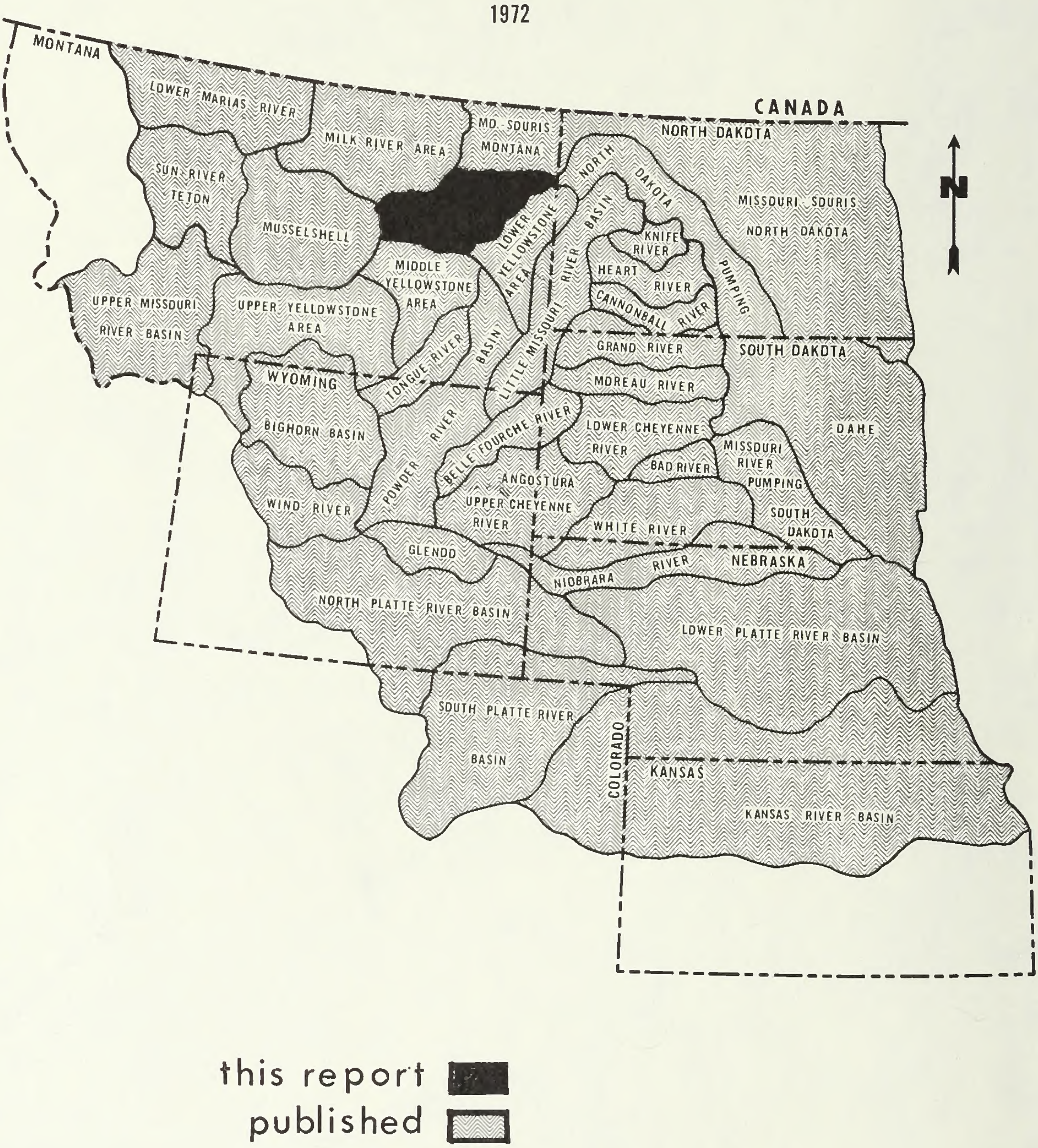
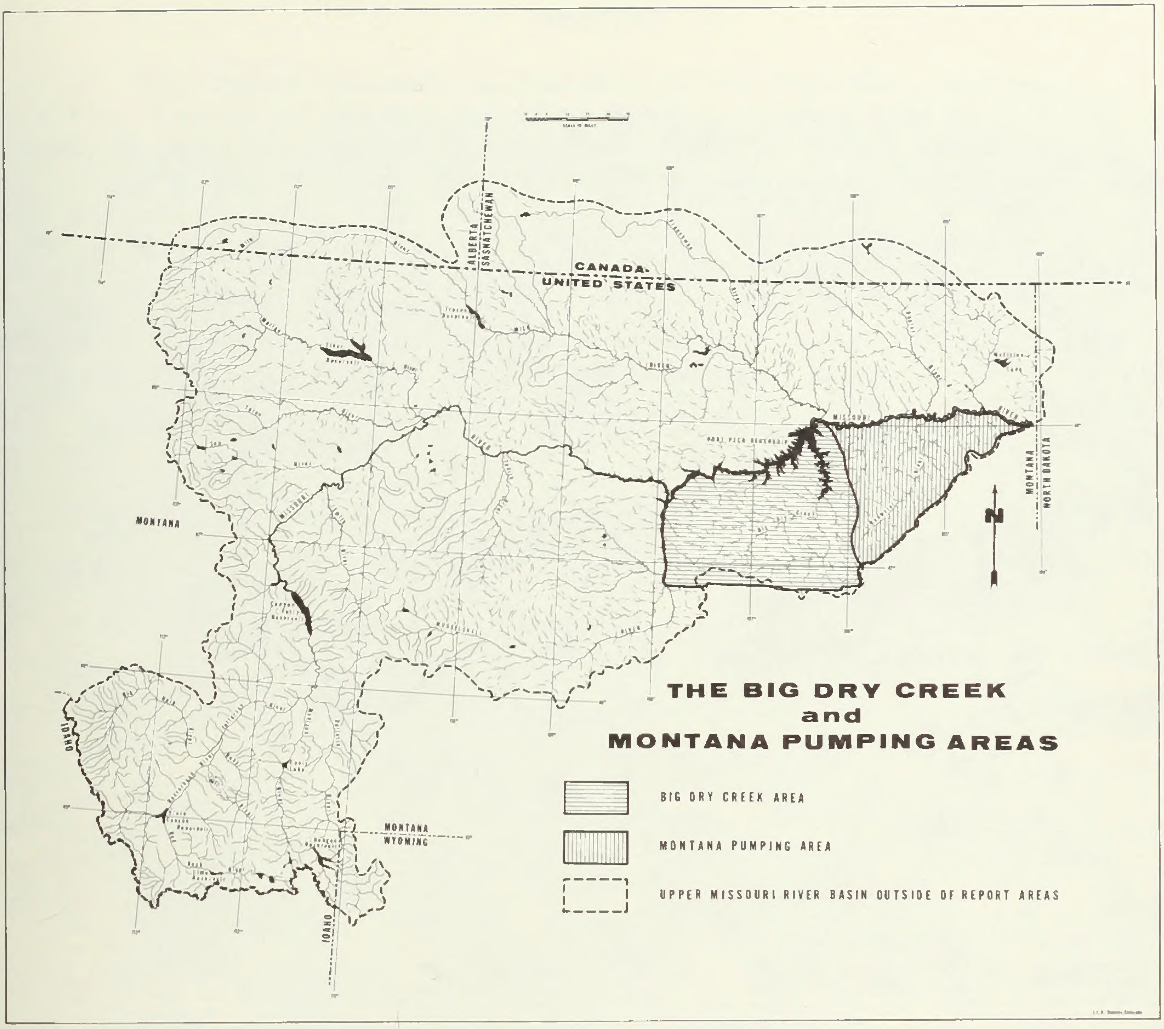
PRESENT STATUS OF BUREAU OF LAND MANAGEMENT STUDIES IN THE MISSOURI RIVER BASIN

(LAND CLASSIFICATION)

1972





THE BIG DRY CREEK
and
MONTANA PUMPING AREAS

The Big Dry Creek-Montana Pumping Area is level-86 percent of its surface. Rough land, such as this has low relief. The economy is agricultural, based on dry farming and range livestock production. Recreation oriented toward watersports and hunting is increasing rapidly. Photograph, U.S. Army, Corps of Engineers

FOREWORD

This report presents an analysis of the physical, economic, and social factors of the Big Dry Creek-Montana Pumping Area of Montana, as they apply to the public lands administered by the Bureau of Land Management in trust for the people of the United States.

This publication is the 36th in a series of 36 reports prepared by the Missouri Basin field group of the Bureau of Land Management in support of the Missouri River project. That project, which is a basin development program of the Department of the Interior, has its basic authority in the Flood Control Act of 1944.

This report presents summarized information of the background and detailed studies on which specific problems were considered and recommendations made for the management and tenure of the public domain lands. The purpose of the detailed study of each tract is to promote its use in the best interests of the public, compatible with proper conservation practices. Public agencies, both federal and local, interested in utilizing these lands are told of their location, description, and prospective utility by two means; this report, and the detailed accounts of each isolated tract.

For each isolated tract of land, an inventory report was prepared, complete with maps, details of condition and recommendations for management. Those reports summarized in the following publication are filed in the Denver Service Center of the Bureau of Land Management at the Denver Federal Center, with copies in the District Office at Miles City, Montana.

The field inventory and analysis of data, and writing of this report were directed by Richard D. Burr, Supervisory Range Conservationist. The report preparation and layout were the responsibility of Mrs. Betty Easton. The maps were prepared by draftsman John L. Kovacs. Editing and direction was given by Eugene L. Schmidt, MRB Program Specialist. Valuable assistance was rendered by the Bureau of Land Management District Office at Miles City, Montana.

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SUMMARY

The Big Dry Creek-Montana Pumping Area lies on the glaciated plains of eastern Montana. It is bounded on the north by the Missouri River, on the west by the Musselshell River, to the east and south by the Missouri River-Yellowstone River Divide and the county lines that approximate that division. The extreme eastern tip reaches the Montana-North Dakota State line.

The basin contains 5.8 million acres. All of Garfield, most of McCone, and small portions of Prairie, Dawson, and Richland Counties, Montana, are included.

The topography varies from intricately dissected badlands and breaks along the Missouri River and its tributaries to level grassy plains. Differences in elevation above sea level are small with extremes of 3,625 and 1,870 feet. This range, however, does not present the sweep of the land, which is that of a plateau with most of the land lying in one general plane.

Population is sparse, with centers of population at Jordan (around 600), Circle (1100), and Richey (around 500). Jordan and Circle are county seats.

The main industry is agriculture. The primary use of the land is livestock grazing.

Public lands administered by BLM or cooperatively with Bureau of Sports Fisheries and Wildlife total roughly 1,054,000 acres out of the 5.8 million acres in the Big Dry Creek-Montana Pumping Area. These lands lie in two general concentrations. The public domain in the west and north part of the area, with 829,000 acres, is the larger concentration on the glaciated plains and the broken and rough topography along the mainstems of the Missouri, the Musselshell Rivers, and Big Dry and Little Dry Creeks. The Charles M. Russell Game Range, cooperatively managed, includes 177,000 acres of withdrawn public domain. Away from the waterways the incidence of public domain drops, but this is partially countered by the addition of acquired lands (former homesteads purchased by the federal government under the Bankhead-Jones Act) which lie on the level, more fertile plains to the southeast.

The climate is dry subhumid to semiarid, and one with frequent drouths; 75 percent of the limited annual rain (11"-16") falls during the growing season. The excellent native grass range of the glaciated plains encouraged ventures into dry farming; marginal farms inevitably failed, swelling the acreage of public lands when many homesteads, repurchased, returned to federal ownership as LU lands. Of the vegetation on public domain grasslands cover 88 percent, brush 6 percent, timber 4 percent; river breaks and badlands constitute the remainder.

Sediment contributed to the Missouri from public domain varies. The breaks and badlands run from 600 to 2,000 pounds of sediment annually to 400 to 600 pounds away from the mainstem. Where topography and soils are favorable the sediment loss drops below 400 pounds annually - but here there is little public domain and only small amounts of public lands administered by BLM. Sediment contribution by Bureau-managed lands is a continuing thing. In 1805, Lewis and Clark found the Missouri River was still the Mighty Muddy as far as the Marias River. The sediment is generated by geological erosion. Public domain with little or no accelerated erosion totalled 77 percent, and that with slight to moderate damage totalled 22 percent. The reason for so little accelerated erosion is the public domain stays within its land capabilities. Most of it, 65 percent, had a land capability for livestock grazing with severe restrictions in use of permanent vegetation; 33 percent can be used for grazing with good management and no restrictions; 1 percent was restricted to wildlife and watershed; 1 percent was fertile lands unable to be cultivated because of recurrent flooding.

Range condition is stated in an ecological context in reference to a division of rangeland (based on soils, topography, rainfall, salinity, drainage, soil depth, etc.) termed a range site. For example, the barren clays and steep shale hills of the badlands form a range site called "Badlands Site." The plant cover on this site will always be sparse, probably salt-tolerant, and surely drouth, heat, and cold resistant. An Excellent range condition on the badlands can contribute little to prevention of erosion, or forage production -- but it still is in the highest ecological condition, and the rating is correct. Such a drastic environment as this is not as common as deep-soiled range sites that have great potentials. On these, the higher the ecological range condition, the higher the soil fertility, and the greater the amount of better forage. Excellent ecological range condition here would thus accord with the concept of range condition based solely on highest production. In accordance with the ecological range condition, 60 percent of the public domain is Excellent; 38 percent is Good; 2 percent is Fair; only a tiny acreage (2,500 acres) is Poor.

In addition to cattle and sheep use of the rolling grasslands, big-game hunting is a proven economic resource. The horizon-wide stretch of grassy plains intermixed with sagebrush range favors antelope; the countless river breaks with cover and protection and their widespread occurrence of junipers favors deer. Upland game (sage grouse, sharptail, and Hungarian partridge) is also important. Cultivated lands interspersed in the public domain maintain a large local population of ringneck pheasant. Waterfowl are abundant.

The Charles M. Russell Wildlife Range, totalling around 900,000 acres, lies within a heavy concentration of public domain along the Missouri and Musselshell Rivers and Fort Peck Reservoir; 177,000 acres of public domain are in the Big Dry Creek-Montana Pumping Area. Its pattern is well-blocked, but its specialized use as withdrawn game range separates it from the rest of the public domain. Recreation opportunities abound here. The wildlife range contains five named State Parks and three State fishing access points.

The remaining 829,000 acres of public domain fell under the Classification and Multiple Use Act of September 19, 1964 (PL 88-607) (78 Stat. 986; 43 U.S.C., 1411-1418) which directed the Department of the Interior to determine, using the criteria of the act, those public domain lands suitable for disposal or for retention in federal ownership. This act expired December 23, 1970. (Classification continues under other authorities. Emphasis remains on public participation in planning and in classification of public lands.)

A careful analysis of all the physical, economic, and social criteria enumerated in the Classification and Multiple Use Act was discussed in public meetings before final action was taken. The climate, past history of use, the varied recreation potentials, areas of scientific interest, the soils and topography, in summary indicated that extensive, rather than intensive (i.e., grazing, permanent range, and recreation as opposed to farming) of the public domain lands was mandatory. An important additional consideration was the public domain land patterns are well-blocked, which fosters easy management and public participation.

The public lands of the Big Dry Creek-Montana Pumping Area were inventoried by River Basin Studies, including the 177,000 acres of public domain within the boundary of the Charles M. Russell Wildlife Range, through cooperation by the Bureau of Sports Fisheries and Wildlife and Bureau of Land Management. Most of the lands were classified by area. In this, the ownership is disregarded in an overall survey because it is efficient to do so, and less costly. The Charles M. Russell Wildlife Range and 682,000 acres of public domain outside its boundaries were covered in this manner. Where public domain lay in scattered small tracts, it was classified in individual parcels. (The parcels are isolated contiguous tracts of public domain totalling less than 1,520 acres.) There were 677 isolated tracts with a total of 147,000 acres classified individually. Of these, 35 tracts with 7,483 acres had been disposed of at the time of publication. Details are given in Appendix A.

The individual tract write-ups are on file in the Miles City District Office and at the Denver Service Center, Denver, Colorado. Recommendations made in this report concerning land tenure are not a final determination. An authorized administrative official of the Bureau of Land Management must pass on all land use proposals before any change in status occurs.

Mammal Butte on public domain south of Fort Peck is a rich source of mammalian vertebrate fossils. The Antiquities Act protects fossils on feder lands from improper use or destruction. Photograph, U.S. Army, Corps of Engineers

GENERAL DESCRIPTION

Location, Size, and Natural Features

The combined Big Dry Creek-Montana Pumping Area in northeastern Montana is 200 miles long by 100 miles wide, and contains 5.8 million acres. It is bounded on the west by the Musselshell River, on the north by Fort Peck Reservoir and the Missouri River running east to the Montana-North Dakota State line, then southwest along the Missouri-Yellowstone River Divide, to the Garfield-Rosebud County line. All of Garfield, most of McCone, and small sections of Prairie, Dawson, and Richland Counties are part of the report area.

Within the Big Dry Creek-Montana Pumping Area the Bureau of Land Management administers 48,000 acres of Land Utilization lands, and 829,000 acres of public domain. That part of the Charles M. Russell Wildlife Range in Garfield and McCone counties encloses an additional 177,000 acres of public domain that is managed for livestock and wildlife use.

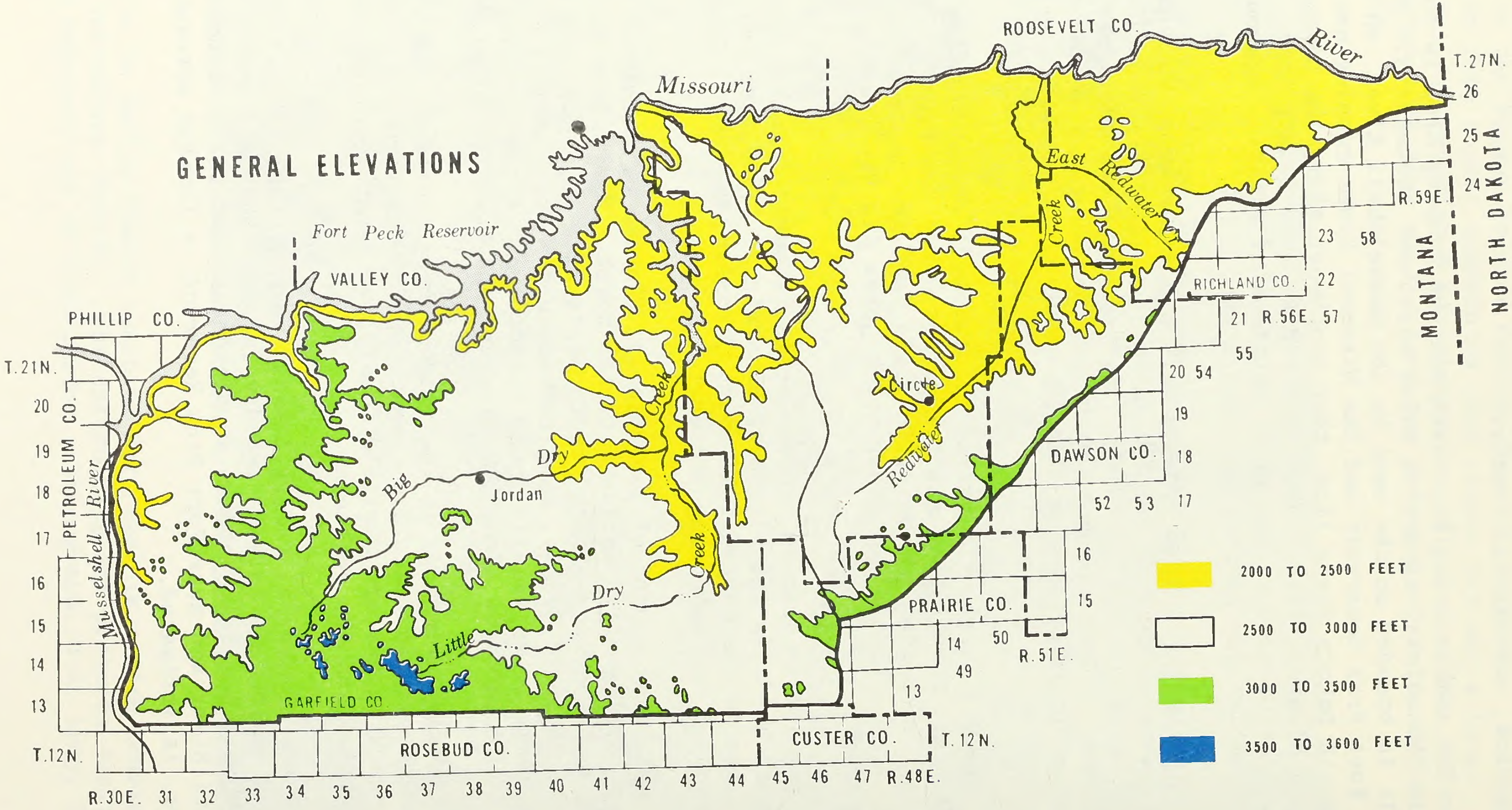
Big Dry Creek, the principal drainage, flows 80 miles through central Garfield County before entering Fort Peck Reservoir. It heads at 3,200 feet elevation, dropping to 2,225 feet at the reservoir; its main tributary is Little Dry Creek which joins Big Dry Creek at Van Norman, Montana.

The stream next in importance is Redwater Creek in McCone County, which heads in the Big Sheep Mountain at 2,900 feet and flows north 90 miles to the Missouri River near Poplar, Montana. Stream flow is greatest in the spring and early summer.

The land, a part of the Missouri Plateau of the Great Plains, is a gently rolling plain inclined to the north. Elevations range from 1,870 feet at the Montana-North Dakota State line to 3,625 feet in southwestern Garfield County. The terrain along the Missouri River and Fort Peck Reservoir is usually rough and broken. A few alluvial flood plains or terraces occur along the Missouri and Musselshell Rivers.

Livestock ranching is the predominant industry. The rough terrain and rigorous climate limits many options in farming. Sheep are more common in western Garfield County, with cattle distributed uniformly throughout the subbasins.

Where the annual rainfall is 15 inches, the plateaus above the river breaks and on the uplands are dry-farmed. The main cash crop is spring wheat; hay is raised as supplemental feed for livestock. Along the Missouri River and near Fort Peck Reservoir a limited acreage, about 5,000 acres, is irrigated.



GENERAL ELEVATIONS

Circle, county seat of McCone County, population 1,000 is the largest town. Jordan, Garfield County seat, and Richey, both number around 500 to 600 persons.

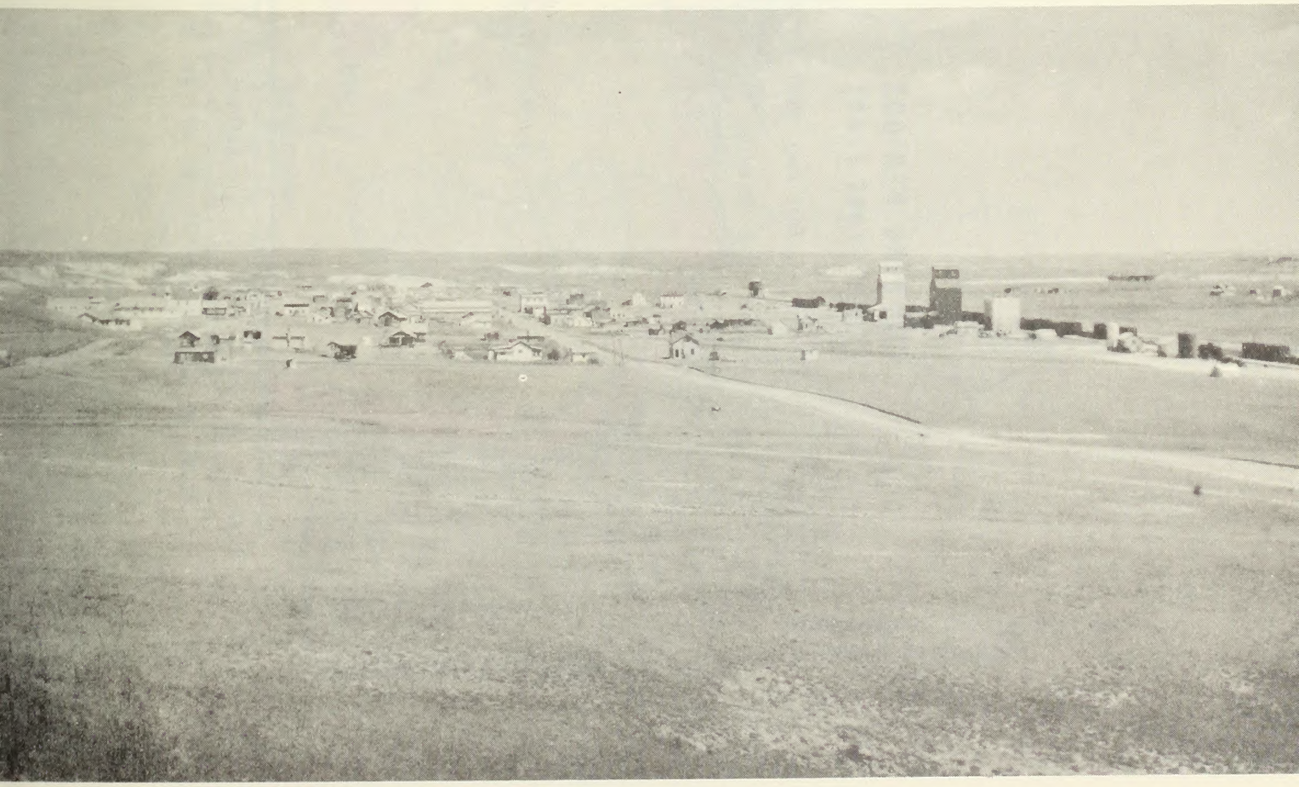
The road net is more intensive and of a higher quality in the eastern half of the area where higher rainfall and greater areas of cultivation encourage higher densities of population.

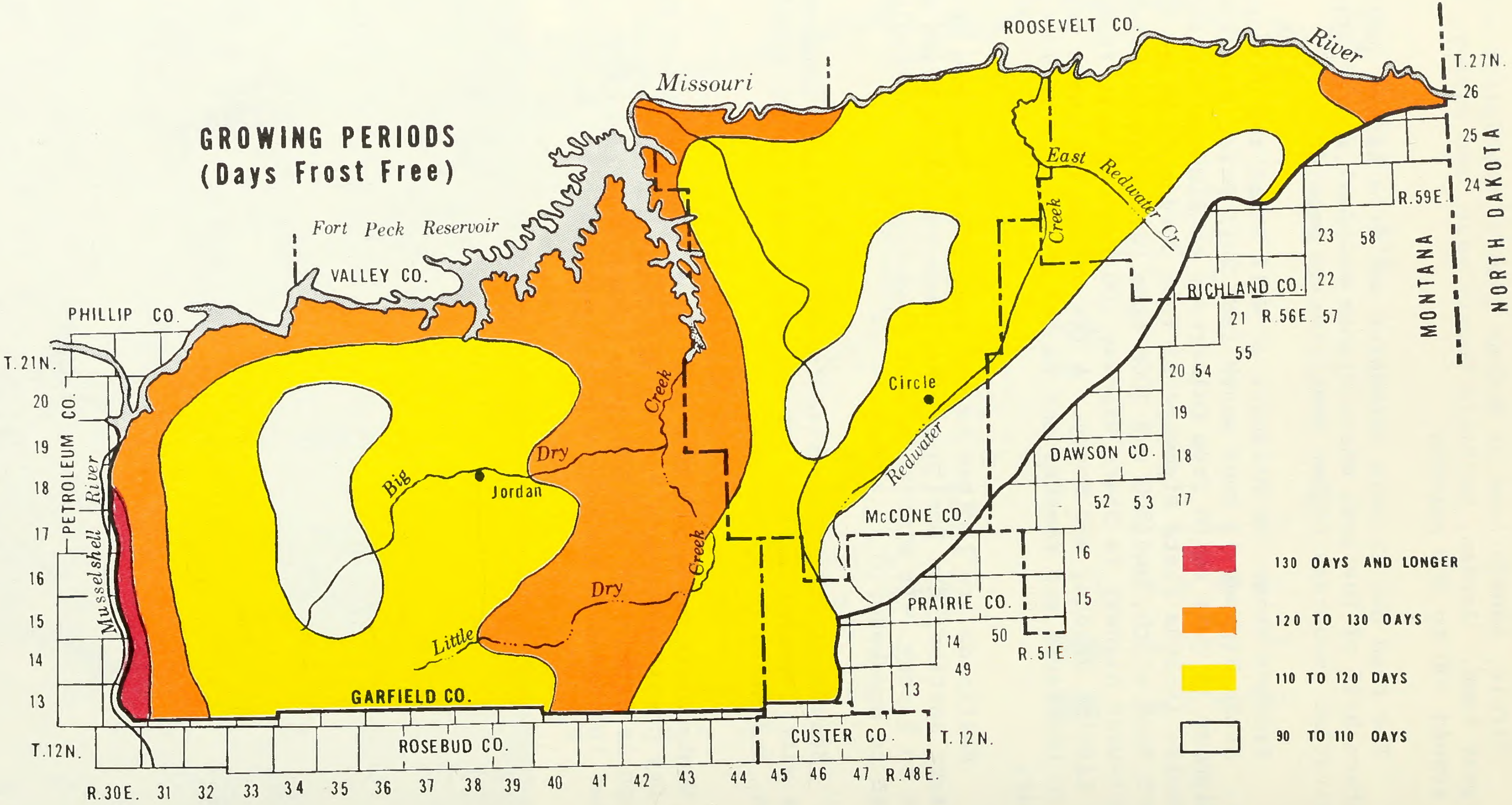
Bridges cross the Missouri at Wolf Point and Culbertson, Montana. State Highway 13 runs south from Wolf Point to Circle, and State Highway 16 runs south from Culbertson to Sidney, Montana. North-south routes include State Highways 22 from Jordan to Miles City, 24 from Fort Peck south, and 200 and 200S from Circle to Glendive. The only east-west highway is State Highway 200 running west from Sidney, through Circle, Jordan, and Mosby. A few unimproved roads provide access to the farms and ranches and to the south side of Fort Peck Reservoir.

Railroads are limited to the spur lines that run to towns in the eastern section; the Burlington Northern parallels State Highway 200 west to Richey. It also runs west from Glendive to Circle, then southwest to Brockway.

Scheduled airline service is not available. Commercial airports with commuter airline service are located at Wolf Point, Sidney, Glendive, and Miles City, Montana.

BELOW
Circle, Montana.McCone County Seat and the largest center of population in the Big Dry Creek -- Montana Pumping Areas. Population growth is slow. The photograph is dated 1928 when the town numbered nearly 1,000; in 1970 this number had increased to roughly 1,100. Photograph by U.S. Geological Survey





GROWING PERIODS
(Days Frost Free)

Climate

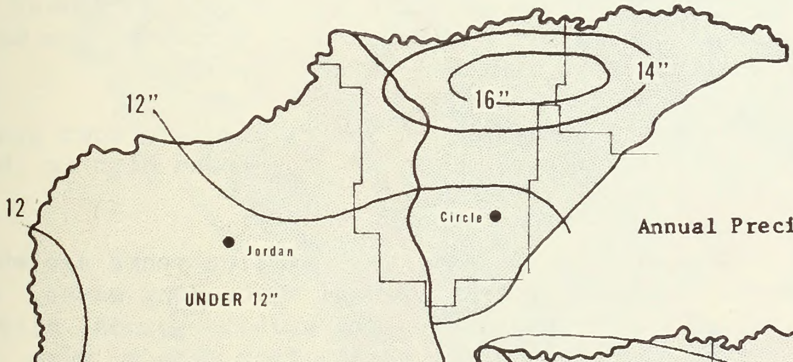
The climate of eastern Montana is characterized by low rainfall, cold and windy winters, hot summers, great temperature extremes, a large percentage of sunny days, and low humidity.

Westerly winds are strong during late winter and early spring. During winter storms, the wind drifts snow into coulees and behind the leeward side of ridges. The upland plains are generally swept clear of snow by the high winds. Chinooks (warm, moist, thawing winds) are common during winter and may persist for several days with velocities up to 50 mph. Hot winds may occur during the growing season, resulting in reduced crop yields.

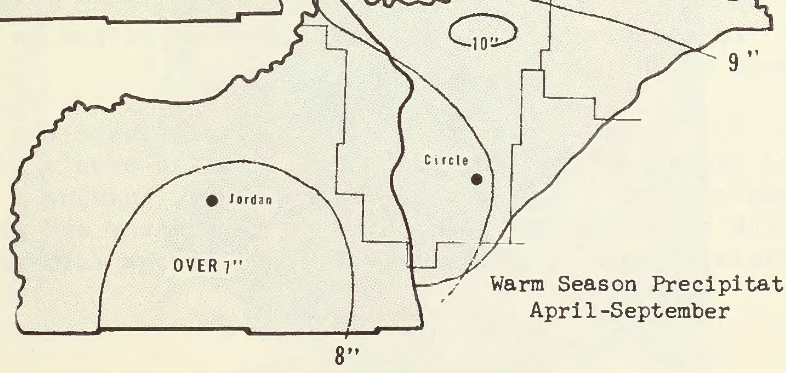
Annual precipitation is comparatively low, averaging 10 to 15 inches per year. Most of the rainfall comes in May and June, with small local showers throughout the summer. The seasonal precipitation pattern, with 75 percent falling during the growing season (early May to late September) favors agriculture. Hailstorms during July and August often cause excessive crop damage.

The mean annual temperature varies from 42° to 44°; temperature extremes range from the record low of -58° to the record high of 112°. The average temperature for January is 14°, for July, 70°.

Circle, to the east, averages a growing season of 115 days; Jordan, to the west, has 125 days; at Vida, to the north, the average is 135 days.



Annual Precipitation



Warm Season Precipitation
April-September

Geology

From the surface outcrops geologists read a history 100 million years old, back to the Mesozoic Era - the Age of Reptiles.

During the later part of the Mesozoic Era, an inland sea intermittently flooded the report area. For several million years, the sea moved back and forth; the land first was water covered, then dry, then reflooded.

Sediments laid down by the sea formed the Colorado, Claggett and Bearpaw shales. Marine life was abundant, therefore, fossil oysters, clams, and ammonites are common, as are the large fossils of sea-going reptiles, Mososaurs and porpoise-like Ichthyosaurs.

During dry cycles, winds deposited sandy material as the basis for the Eagle, Judith River, and Fox Hills sandstones. During these dry periods, the soil supported vegetation that entered the fossil record as leaves, stems, and fruits. When the inland sea retreated for the last time, sandy outwash from the rising Rocky Mountains laid down the Hell Creek sandstone. These beds have many dinosaur fossils, particularly south of Fort Peck Reservoir, where the armor-plated three-horned Triceratops and the giant "king of the reptiles," Tyrannosaurus, are well represented. With these giant reptiles, the Mesozoic Era came to an end. The dinosaurs became extinct about 70 million years ago and the Cenozoic, or Age of Mammals, began.

The outwash from the rising Rocky Mountains continued, creating the Fort Union formation. The Hell Creek and Fort Union formations are similar; both erode into high steep ledges called "somber beds" because of their drab colors. The Fort Union formation has more numerous and larger coal beds than the Hell Creek formation.

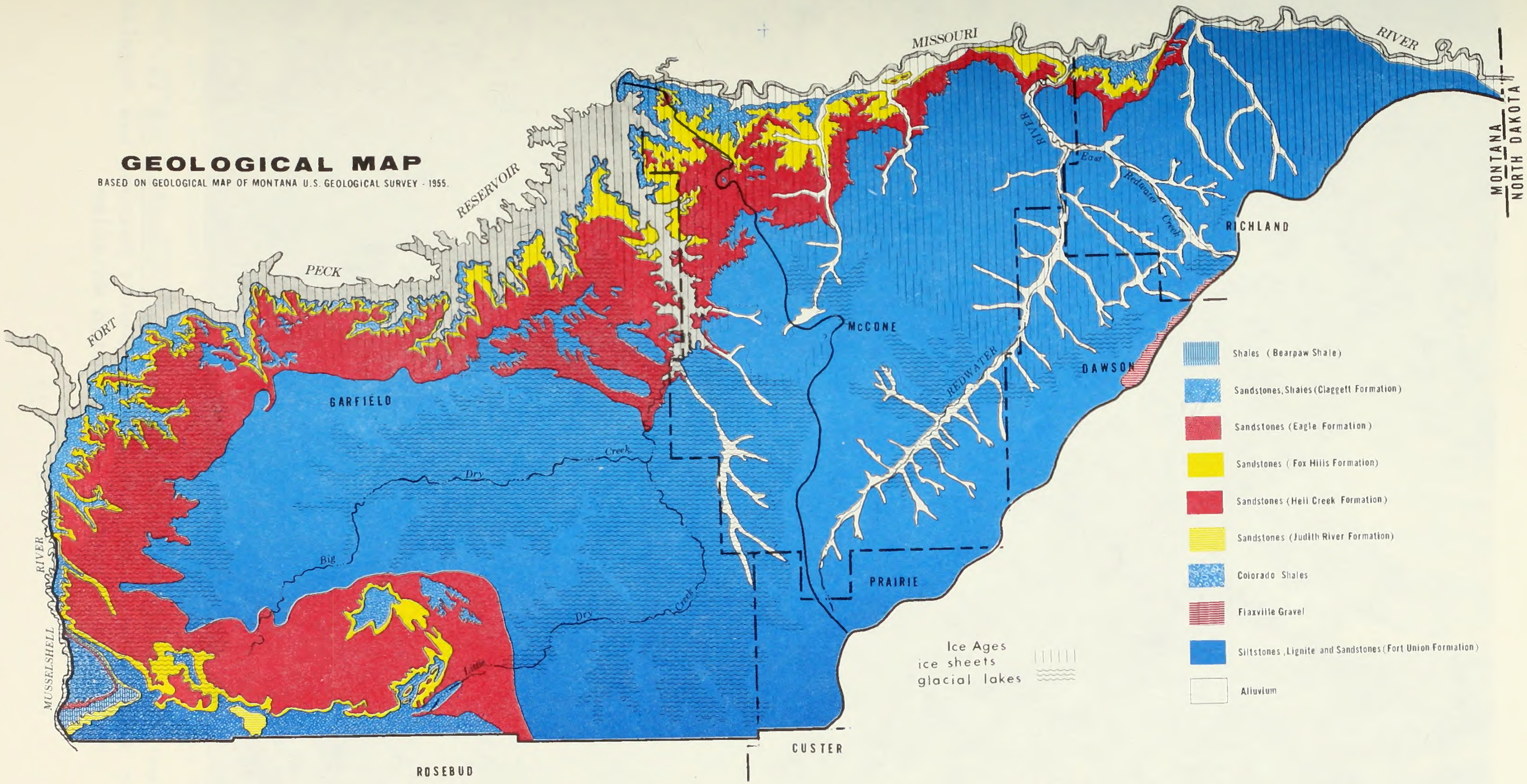
Over 3 million years ago, streams and rivers laid down gravel banks. These banks, the Flaxville gravels, are now found high in the uplands, many miles from present streams.

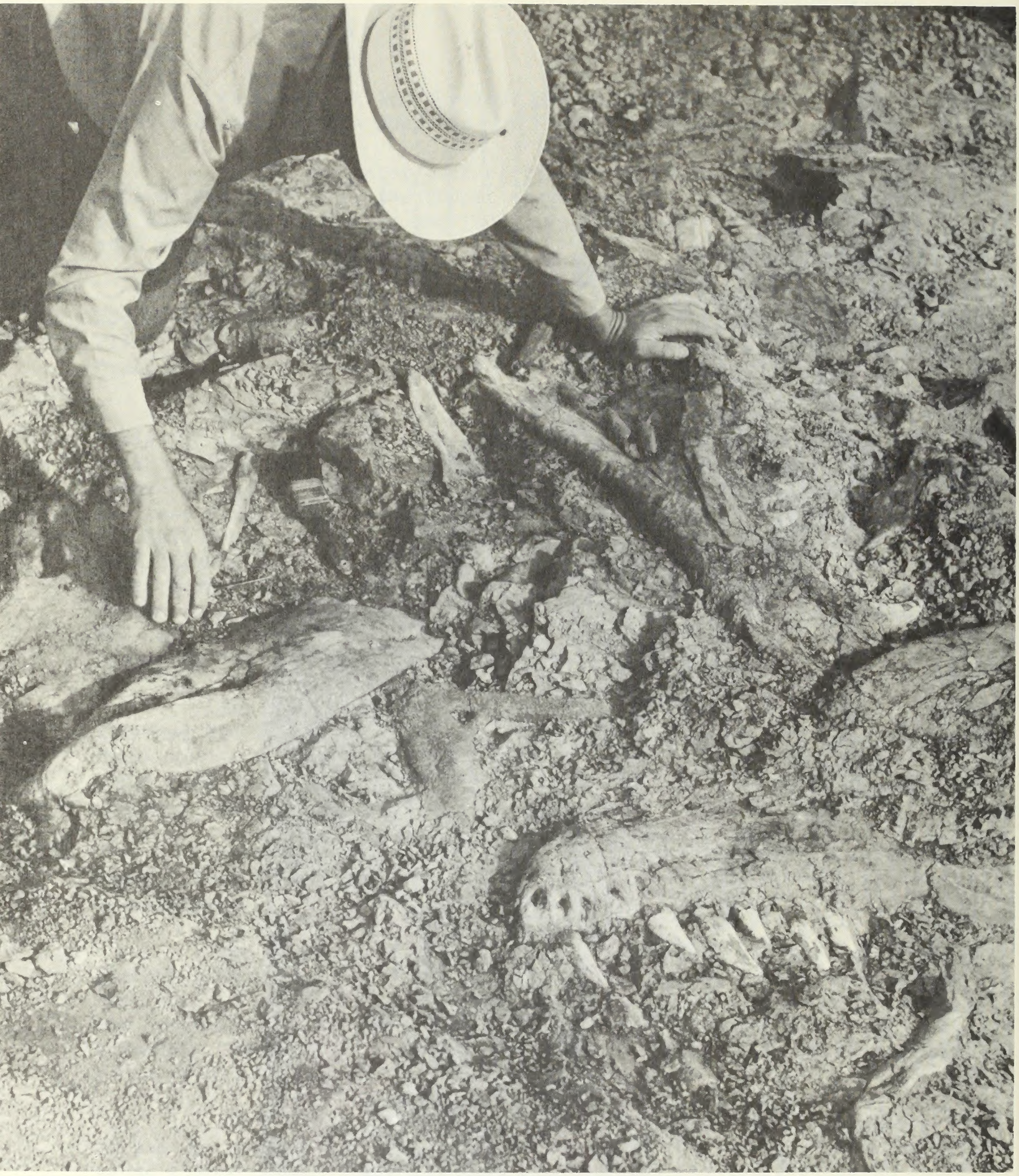
The last geological chapter started 3 million years ago when glacial sheets advanced into the area in several succeeding waves. When the last ice sheet melted 20,000 years ago, the gravels, sands, clays, and large boulders carried by the glacial sheets from Canada, were revealed. In addition, sands and silts were deposited in large glacial lakes dammed by the ice.

Folded and warped rock structures indicate the possibility of oil and gas deposits. The Mosby Dome, in the area's southwest corner, is an example. The dome's top has eroded away, leaving a circular pattern with the older Colorado shale in the center and the progressively younger Eagle, Claggett, Judith River, and Bearpaw formations around the outside.

GEOLOGICAL MAP

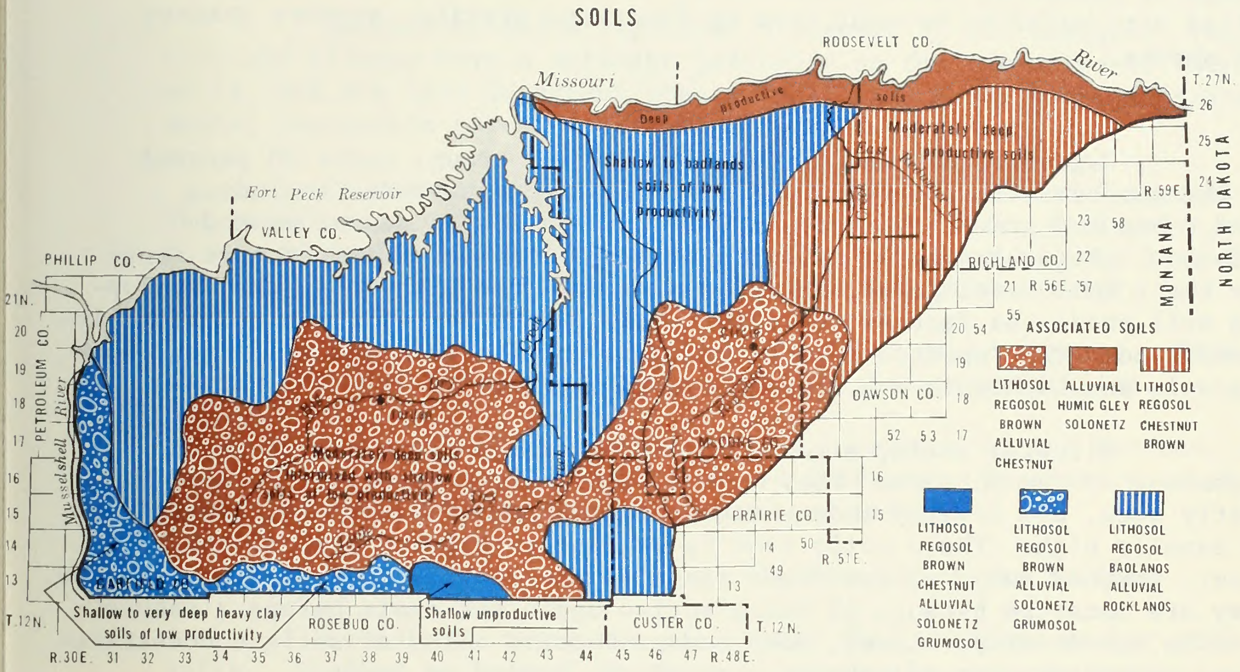
BASED ON GEOLOGICAL MAP OF MONTANA U.S. GEOLOGICAL SURVEY - 1955.





A heavily-toothed jaw of the great dinosaur Tyrannosaurus rex is uncovered by scientists of the Los Angeles County Museum, Los Angeles, California. Photograph, Courtesy of Dr. David Whistler

Soils


SOILS
ROOSEVELT CO.
Missouri
River
Deep productive soils
Moderately deep productive soils
Shallow to badlands soils of low productivity
Fort Peck Reservoir
VALLEY CO.
PHILLIP CO.
PETROLEUM CO.
Musselshell River
GARFIELD CO.
Moderately deep soils intermixed with shallow soils of low productivity
McCONE CO.
DAWSON CO.
RICHLAND CO.
PRAIRIE CO.
ROSEBUD CO.
CUSTER CO.
Shallow to very deep heavy clay soils of low productivity
Shallow unproductive soils
MONTANA
NORTH DAKOTA
T.27N.
T.12N.
R.30E.
R.48E.
R.51E.
R.56E.
R.59E.
ASSOCIATED SOILS
LITHOSOL REGOSOL BROWN ALLUVIAL CHESTNUT
ALLUVIAL HUMIC GLEY SOLONETZ
LITHOSOL REGOSOL CHESTNUT BROWN
LITHOSOL REGOSOL BROWN CHESTNUT ALLUVIAL SOLONETZ GRUMOSOL
LITHOSOL REGOSOL BROWN ALLUVIAL SOLONETZ GRUMOSOL
LITHOSOL REGOSOL BADLANDS ALLUVIAL ROCKLANDS

Shallow soils cover 86 percent of the land; topographic land forms account for 14 percent. Almost without exception, the soils have developed from sedimentary clays and sandstones. Parent materials, topography, and age were most important in the genesis of the soils; climate played a lesser part.

Azonal Soils Group - 56 Percent of the Surface

Azonal soils cover more than 5 out of every 10 acres. These are immature, young soils, with little or no developed profile because either soil erosion keeps pace with soil formations, or deposits of parent material are so new insufficient time has passed for profile development.

Lithosols, the most common, make up 29 percent of the surface. They are soils in which the "A" or upper horizon rests on resistant rock. Lithosols in rugged, broken country develop on steep slopes and remain perpetually immature because the soil material erodes away as it forms. Rock hardness also influences mature soil development because the harder rocks may weather so slowly, erosion can remove soil as it forms.

Ridges and hills with soils from rocky parent material support stands of ponderosa pine. Less steep, rocky slopes and the valleys, filled with material brought down by frost and gravity, support grasses and shrubs.

Regosols, another of the Azonal soils group, cover 20 percent of the surface. They develop on unconsolidated materials, including sand dunes and gravel deposits, or soft rocks such as sandstone and mudstone. Regosols may be immature because of an insufficient time lapse for their full development, or as happens with the Lithosols, the developing soil erodes as fast as it forms. Most of the Regosols are on privately-owned land. They produce forage important to livestock and wildlife. Both Regosols and Lithosols are low in organic matter.

Alluvial soils, also in the Azonal soils group, cover about 7 percent of the surface. They have a weakly developed profile, are mostly deep, and develop from water-deposited parent materials. Fertility is usually high. These soils tend to be coarse-textured next to the river; farther away, on the flood plain's outer edge, they are fine-textured. They are immature because of being buried again and again before a mature profile can develop. Level, deep and productive alluvial soils concentrated along permanent streams make up most of the irrigated lands.

Zonal Soils Group - 27 Percent of the Surface

Zonal soils are fully developed mature soils, where there is no further profile change, despite the continued action of soil-forming influences.

The moderately fertile Brown soils develop under a semiarid climate, and constitute 17 percent of the surface. Brown soils have an accumulation of carbonates in a 3-inch band at depths of 12 to 15 inches. On the Brown soils, annual rainfall is often insufficient to assure a crop each year. Because of this restriction, dry farming, a technique of moisture conservation, is the most common system. Small grains are planted in the fall on fields kept clear of all vegetation during the spring and summer; stored moisture from the past summer germinates the seed. The seedling usually remains viable over winter and matures the next summer. With good years, spring wheat may be planted purposely or as a catch crop if freezing weather kills the winter wheat. Yields average about 15 bushels per acre.

At higher elevations, under increased rainfall, Chestnut soils develop. The Chestnuts are similar to the Brown soils but are deeper and more fertile, with a carbonate accumulation at depths of 15 to 20 inches below the surface. Chestnut soils make up 10 percent of the surface.

Intrazonal Soils Group - 3 Percent of the Surface

Intrazonal soils represent 3 percent of the surface. Vegetation and climate have a definite influence on the formation of Intrazonal soils, but are less important than a local influence, such as saline shale, bentonitic parent material, or poor drainage.

Grumosols are deep, heavy clays, covering about 1 percent of the report area. In subhumid climates these soils are productive, but in the semiarid climate of the Big Dry Creek-Montana Pumping Area they are limited to native range plants and have low productivity.

Solonetz soils are saline soils with minor acreage. They support limited amounts of scattered salt-tolerant vegetation.

Humic Gley, representing about 1 percent of the surface, occurs in pockets along stream floodplains and terraces. Vegetation consists of moisture-loving plants, usually rushes and sedges.

Miscellaneous Land Types - 14 Percent of the Surface

Land types represent geomorphic land surfaces rather than soils. Erosion or lack of weatherable materials prevents soils development.

Badlands are a miscellaneous land type that constitute 9 percent of the surface. This type has a very steep, broken relief, often stony, and is usually on weakly consolidated shale. It is intensely dissected and the surface is essentially barren. Runoff is high and geological erosion is active.

Another miscellaneous land type, Rocklands, represents about 5 percent of the surface. Land of this type has rock outcrops, rock rubble, or stones and boulders dominating 25 to 90 percent of the surface. Such plants as do occur are trees, shrubs, and a sparse cover of grasses and forbs. Scoria, a red slag common in the southern parts of the area, indirectly affects soil formation. Scoria, or clinker, was once molten rock formed in prehistoric subterranean coal fires. The soft clays and sandstone, once overlaying the coal beds, have eroded away. Hard, resistant to erosion, the scoria remained and perpetuates a rugged surface.

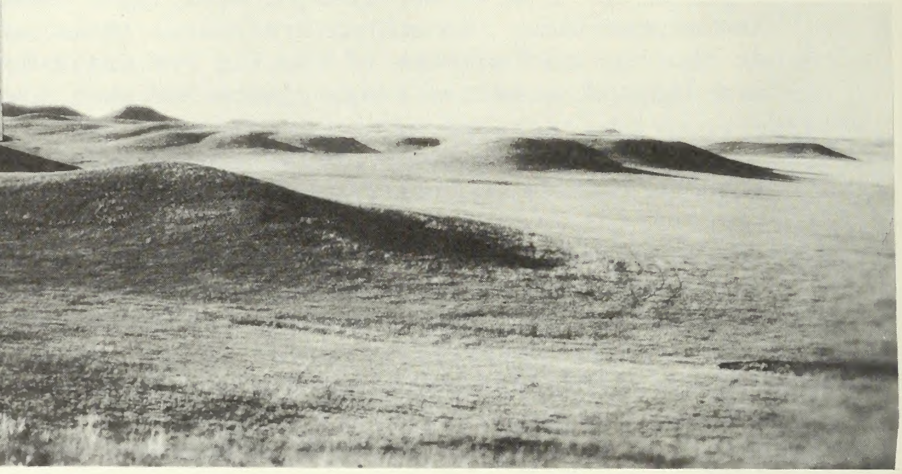
Throughout the area, an unusual form of erosion called "soil piping" occurs, and in some cases it is the major agent responsible for the landscape's appearance. Soil piping is discussed in Appendix A.

LEFT

An unusually large block of scoria or clinker. Scoria, or clinker, was once molten rock formed in prehistoric subterrranean coal fires.

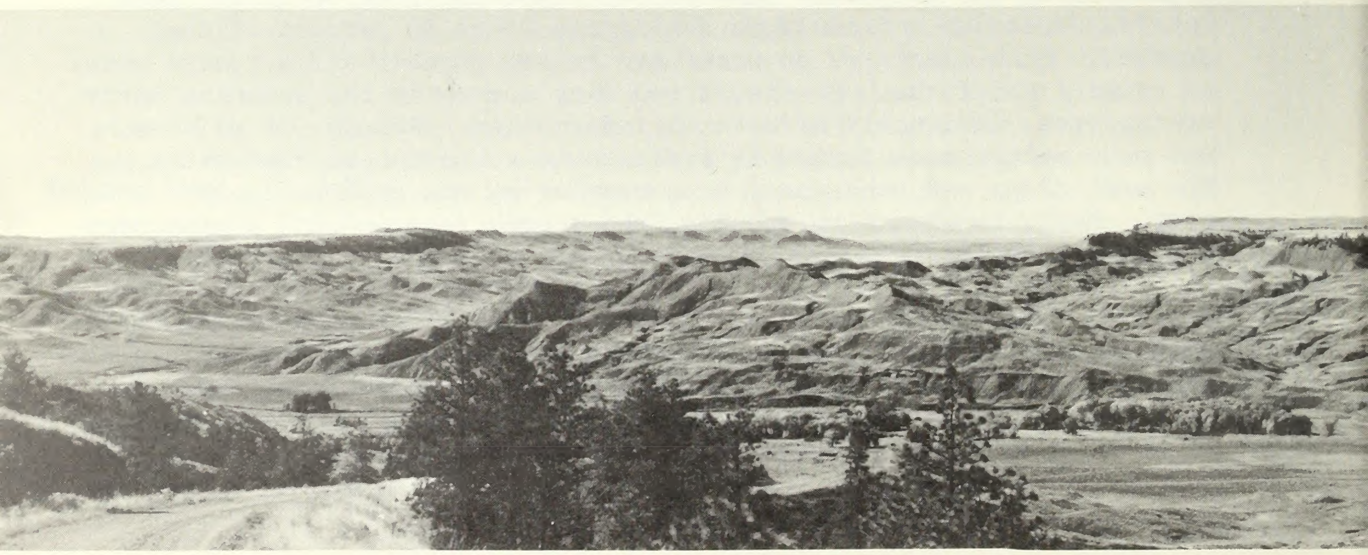
BELOW

Clinker or scoria, highly resistant to erosion, protects the surface, usually as dull-red gravel to form low hills when softer soils erode away. Photographs U.S. Geological Survey



BELOW

Small terraces originating from land slumps, characterize the rugged Missouri River Breaks; formed by saturated subsoils shearing in weak planes, the soils slip downward as a "land slump". Many small slumps are apparent. Photograph, Bureau of Land Management



Another geological influence of great importance in determining land form occurs as "soil slumping" on steep slopes along the Missouri River breaks. Slumping is a form of sliding in response to gravity, where massive segments of steep hillsides move downward in place following instability from water infiltration above an impermeable layer.

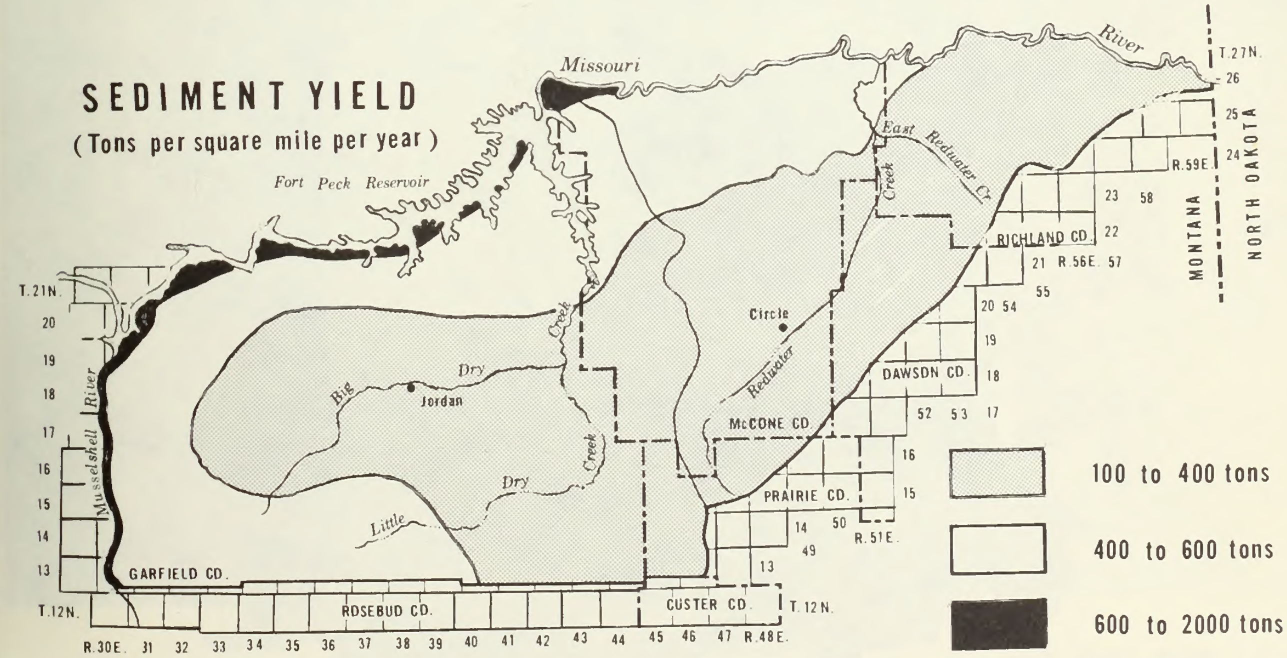
The Big Dry Creek-Montana Pumping Area's soils are, in general, well adapted to their present use: livestock grazing, wildlife habitat, cultivated cropland, and watershed. They are used within their natural limitations. A small percentage, the cultivable soils, are economically important.

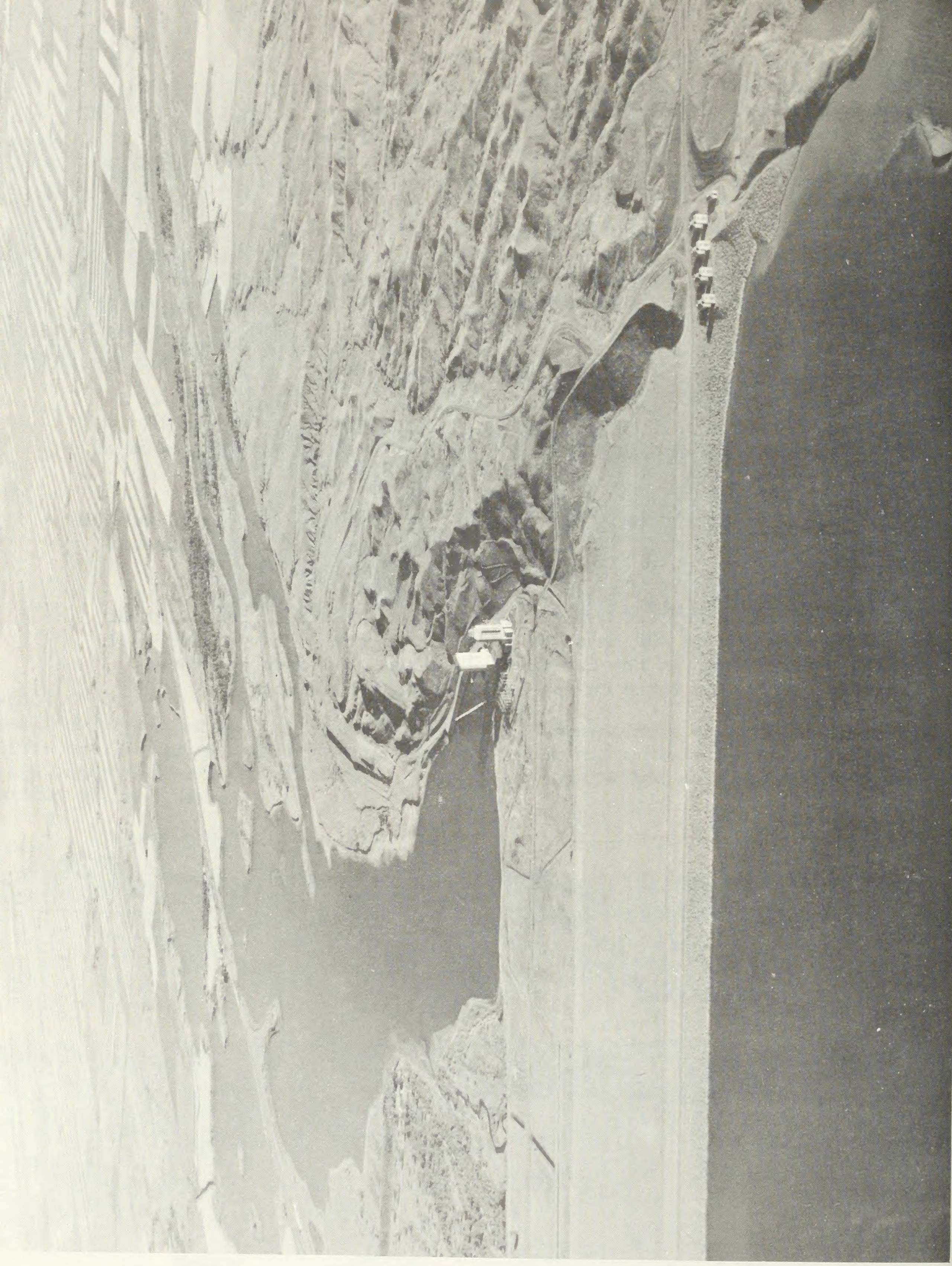
Sediment Yield

The rough, broken lands along Fort Peck Reservoir, both public land and privately owned, contribute heavy amounts of sediment up to 2,000 tons per square mile per year.

Sizeable amounts of sediment, 400 to 600 tons per square mile annually, also come from badlands along the Musselshell and Missouri Rivers. Much of this is public domain.

The Big Dry Creek and Redwater drainages contribute lesser amounts, from 100 to 400 tons per section per year. Large blocks of public domain occur in the Dry Creek drainage, but only scattered isolated tracts are found in the Redwater Creek drainage.





Fort Peck Dam and its' reservoir have strong impact on the report area. Photograph U.S. Army, Corps of Engineers.

Fish and Wildlife

Lewis and Clark in 1805 reported incredible numbers of buffalo, bighorn sheep, elk, whitetail deer, mule deer, and pronghorn antelope. Carnivores, such as grizzly bears, wolves, and coyotes were also common. The pressures of settlement caused wildlife numbers to diminish drastically after 1880, until, by 1920, the remnants of the big game herds had disappeared. The grizzly bear vanished before 1880, but the wolf survived into the modern era.

Some big game species have recovered a part of their former numbers. The pronghorn antelope, mule deer, and whitetail deer are most commonly hunted; their numbers are still increasing modestly under careful management. Limited elk hunting is allowed in specific locations.

Hunter interest is increased by an overlapping deer and antelope season. On the average, 1,100 acres produce one harvestable deer and 2,400 acres produce one harvestable antelope. In more favorable habitat the figure is 700 acres for one antelope.

Rocky Mountain bighorns are planted on the C. M. Russell Wildlife Range on a 3,000 acre section set aside for their sole use. No hunting is as yet permitted.

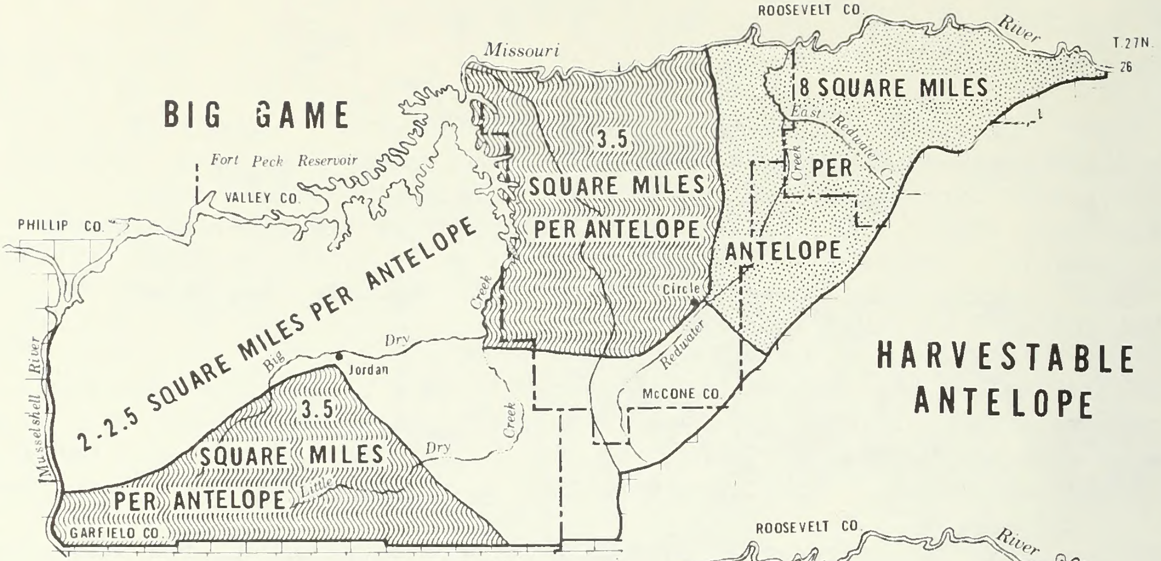
Favorable habitats abound for Hungarian partridge, sharptail grouse and sagegrouse. Ringneck pheasant are common near cultivated fields. Merriam turkey plantings are successful on the Charles M. Russell Wildlife Range; their numbers are increasing.

The Central Water Fowl Flyway is nearby, thus ducks and geese, both migrants and resident breeders, occur in large numbers.

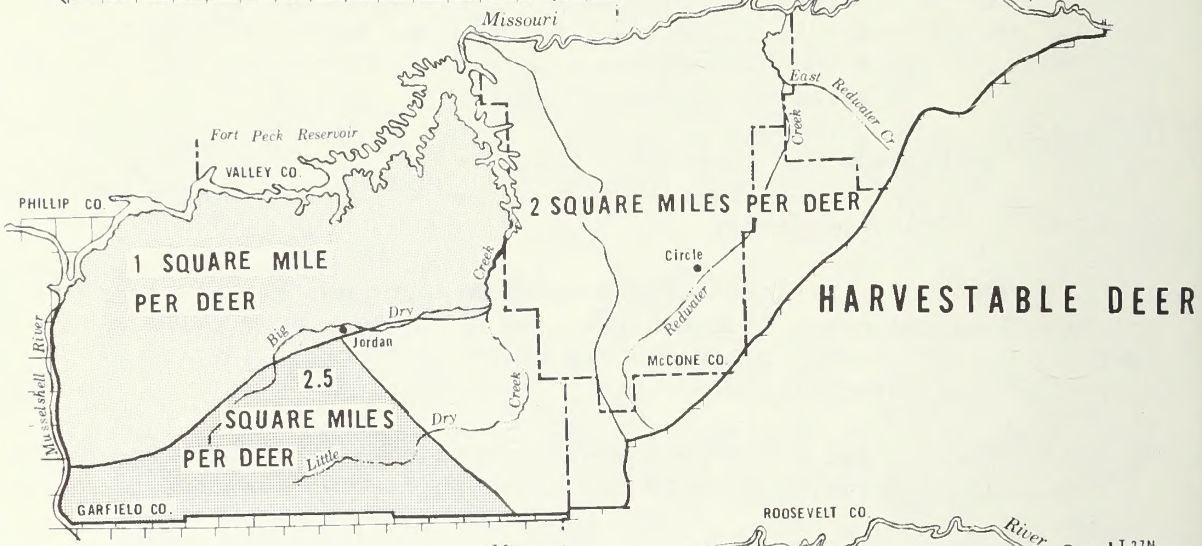
Fishing is popular on Fort Peck Reservoir and the Missouri River. Catches include trout, catfish, northern pike, sauger, perch, bullhead, sturgeon, and paddlefish. There are also walleye pike, ling, and fresh water drum, and crappie. The 6 miles of the Missouri River immediately below Fort Peck Reservoir offers the best stream fishing locally. Farm reservoirs are systematically stocked with rainbow and brook trout.

BIG GAME

HARVESTABLE ANTELOPE

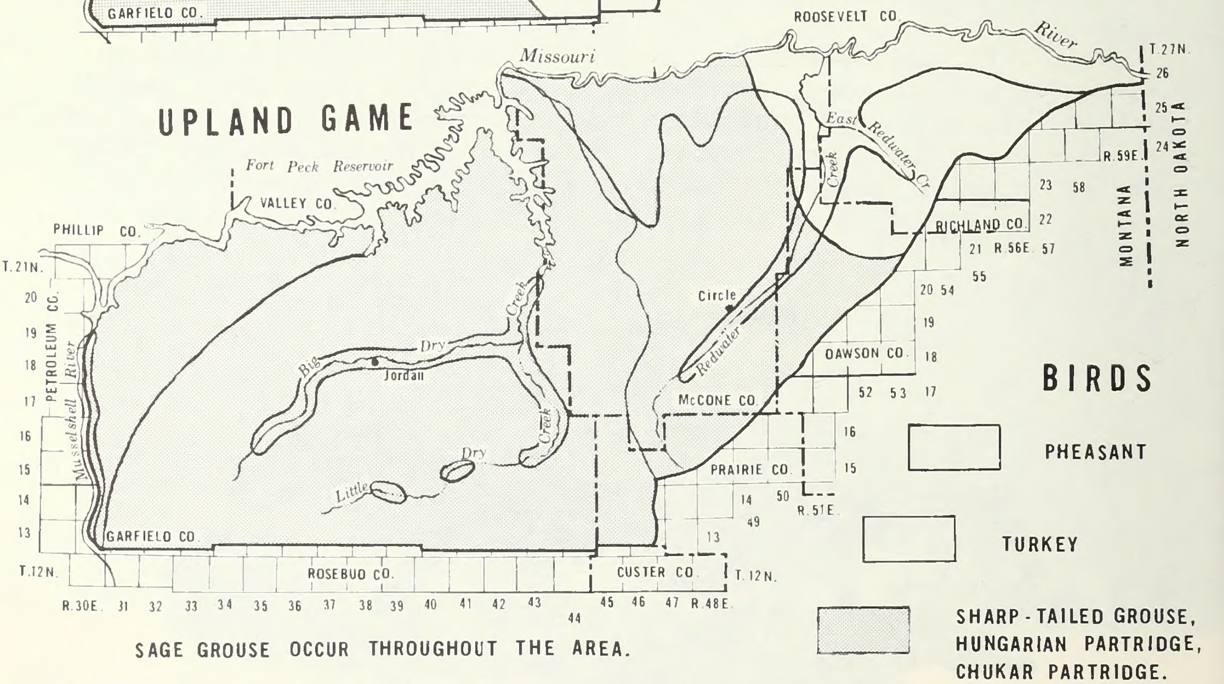


HARVESTABLE DEER



UPLAND GAME

BIRDS



SAGE GROUSE OCCUR THROUGHOUT THE AREA.

Vegetation

Rolling grassland plains dominate the area. Western wheatgrass (bluestem wheatgrass), blue grama, and needleandthread are the most common forage, followed by bearded bluebunch wheatgrass and green needlegrass. Other frequently encountered grasses include stonyhills muhly, Sandberg bluegrass and little bluestem.

Shrubs are important in the upland vegetation, big sagebrush is the most abundant. Fringed sagebrush and silver sagebrush follow, both are important to livestock or wildlife. Other shrubs are buffalo berry, chokecherry, snowberry, serviceberry, willow, rose, and creeping juniper.

Plains cottonwood occurs along the stream beds. Ponderosa pine and Rocky Mountain juniper form thin stands on the ridges. The timber is useful primarily for poles and posts.

Poisonous plants are widespread, but livestock losses are few. Death camas is responsible for the loss of a few sheep, and cockleburrs, usually on raw soils in dry streams or new dirt-work, cause an occasional cow loss. The large amounts of prickly pear cactus distributed throughout the area are normal. Since Lewis and Clark's expedition in 1805, explorers have noted its widespread occurrence, often in considerable densities.

Big Sheep Mountain, highest elevation of report area, is just over 3600 feet above sea level. Photograph, U.S. Geological Survey.

HISTORY

Early History and Exploration

The first people identified in the Big Dry Creek-Montana Pumping Area were the Early Hunters. These Indians depended upon the great numbers of big game animals roaming the plains from 8000 B.C. to 6000 B.C. But the climate changed, and with it the vegetation, then suddenly the big game animals disappeared. The Indians were forced to rely on smaller animals and plants for their food. A new culture emerged, the Foragers - from 6000 B.C. to A.D. 500.

The Foragers were replaced in turn by a culture known as the Late Hunters, A.D. 500 to A.D. 1870. They developed with the sudden resurgence in the numbers of big game animals, to merge into the foreign culture of the white invaders. During historic time, with the introduction of the horse from Europe, the way of life of the hunters had changed rapidly. So effecitve were these horsemen, some historians argue the buffalo were already on the way to extinction before white settlement.

The newly acquired mobility encouraged development of new techniques and implements such as communal hunting, buffalo drives, bows and arrows, and moveable shelters. In historic time the Shoshone hunted the buffalo of the Big Dry country, but by 1805, displaced by Blackfeet, Sioux, and Crow who were entrenched in the area when the white men came, they had been forced westward beyond the reaches of the Missouri River.

American exploration began with the Lewis and Clark expedition of 1804-1806. The British fur companies, however, had trapped this country since the latter part of the 18th century. In 1772, traders of the Hudson's Bay Company had a post on the Missouri River in the vicinity of Mandan, North Dakota; in 1787, the Northwest Company and XY Company also established posts there.

The Missouri River Basin supported great quantities of game and valuable fur bearers. American fur traders moved in in numbers shortly after the return of Lewis and Clark.

In 1822, Fort Henry was constructed at the mouth of the Yellowstone River; it was replaced by Fort Union in 1829. The first steamer to dock here was the "Yellowstone" in 1832.

The firm of Durfee and Peck built the Fort Peck trading post in 1867. The fort was manned by 15 to 20 men. Purchased by the Government in 1874, it served as the Fort Peck Indian Agency until 1879. Wolf Point, Montana, also on the Missouri but farther east, was a large trading post and shipping point.

The Farmers and The Settlers

With establishment of the Fort Peck and Fort Belknap Indian Reservations in 1877, unreserved Indian lands were opened to settlement. Cattlemen moved in. The grassy plains were as ideal for cattle as they had been for buffalo.

The first cattle came from the western part of Montana, where ranching had been carried on for almost a generation. During the 1880's, trail herds from Kansas and Texas entered the Big Dry Creek area by way of the Powder River Trail. These animals thrived on the open range until the winter of 1886-1887, when more than half their number perished. Stockmen learned their lesson; they were forced to put up hay and feed their cattle during the winter. Big spreads declined, and smaller ranches encouraged as a consequence. Open range diminished until its end about 1910.

The earliest settlers and settlements were near the frontier military posts. Settlers then were usually "squatters" because the lands were unsurveyed. A legal claim could not be established until surveyed by the General Land Office. However, by their residence and farming these pioneers acquired a "settlement right." A bona-fide settlement right formed the basis of formal entry on the land once official plats of survey were filed.

Settlement spread out from the forts along the military roads between posts; new settlements formed ahead of the advancing railroads. The Northern Pacific came into Montana from the east in 1881 to extend westward up the Yellowstone River Valley. Branch lines were built from Glendive to Sidney in 1912 and to Circle in 1928.

These railway lines were to set the predominant pattern of settlement; but settlement generally outstripped the construction of feeder lines to shipping centers. Lack of adequate shipping facilities handicapped agriculture. Throughout much of the region hauling distances to railheads ranged from 10 to more than 25 miles one way, one-half to a full day's journey by horse and wagon if roads were good.

In the period from 1907-1917, practically all of the land suitable for cultivation was homesteaded and plowed. This was the "dry land movement" that brought settlers to eastern Montana and the western Dakotas. The land was farmed in small units with horse-drawn equipment with fair to good success until the drought of 1919. Then many farmers moved away. Operating units increased in size as the use of power equipment grew during the 1920's.

The long drought of the 1930's hurt. Economic depression with low prices combined with poor crops, short feed on the ranges, and dry water holes -- livestock died, soil blew away. Again people left their ranches and farms.

During the late 1930's and early 1940's precipitation and prices began to recover. More tractors and combines were used on the dry-land farms. The economics of large-scale farming encouraged formation of still larger units. Dry farming and irrigated land operations were mechanized by the power mower, rakes and stackers, and the tractors, trucks, and harvesters.

Low production and virtual failure of hay crops in dry years increased private irrigation systems pumping directly from the Missouri River, its tributaries, or from wells, to irrigate the river bottomlands.

Today, the open plains of the Big Dry Creek-Montana Pumping Area still retain much of the charm and simplicity of earlier days. The light population and lack of large towns or industries attract a few visitors now; in a few years, the Big Sky of Montana may seem to contract a bit, but the "wide-open spaces" will continue here, hopefully, for time to come.

ECONOMIC AND SOCIAL DEVELOPMENT

The economic backbone of the Big Dry Creek-Montana Pumping Area is agriculture, employing the largest manpower force and accounting for 30 percent of gross sales. Other businesses depend on agriculture in association with, or directly related to, farming and ranching. Sales and selected service enterprises rank next to agriculture in total income. Minerals, tourism, and manufacturing are also significant in the economy.

In 1960, 31 percent of the labor force was in agriculture, 20 percent in services and finance, 20 percent in trade, 11 percent in transportation and utilities, 6 percent in construction, 4 percent in manufacturing, and 3 percent in mining.

The 1969 average median family income for the two counties, McCone and Garfield, was $3,613. This is 24 percent less than the 1959 statewide average median income of $4,943.

Population

Population in the area increased from the time of settlement to 10,115 in 1920. Based on 1970 census data, the population has trended steadily downward to 4,513. This represents less than two persons per square mile. Population centers are Circle, 1,000; Jordan, 500; and Richey, 400.

Agriculture

Agriculture is principally grain and livestock production. About 80 to 85 percent of the land surface is utilized in some form of agriculture; 10 percent (600,000 acres) is under irrigated farming.

During an 11-year period, 1954-1964, the number of farms decreased 19 percent from 2,900 to 2,400; the average size increased 28 percent from 2,800 acres to 3,900 acres.

The value of all farm products sold during 1964 totaled $19,852,000, approximately 55 to 60 percent from livestock and livestock products; the remainder, 40 to 45 percent, was from crops. The four most important crops, in order of total acreage, are wheat, barley, hay, and oats. Crops of lesser importance are sugar beets, safflower, flaxseed, and rye. The average commercial farm made between $10,000 to $20,000 during 1964.

Less than 2 percent of McCone and Garfield Counties is commercial forest. The timber is used locally for posts and poles. Some ponderosa pine sawtimber is logged.

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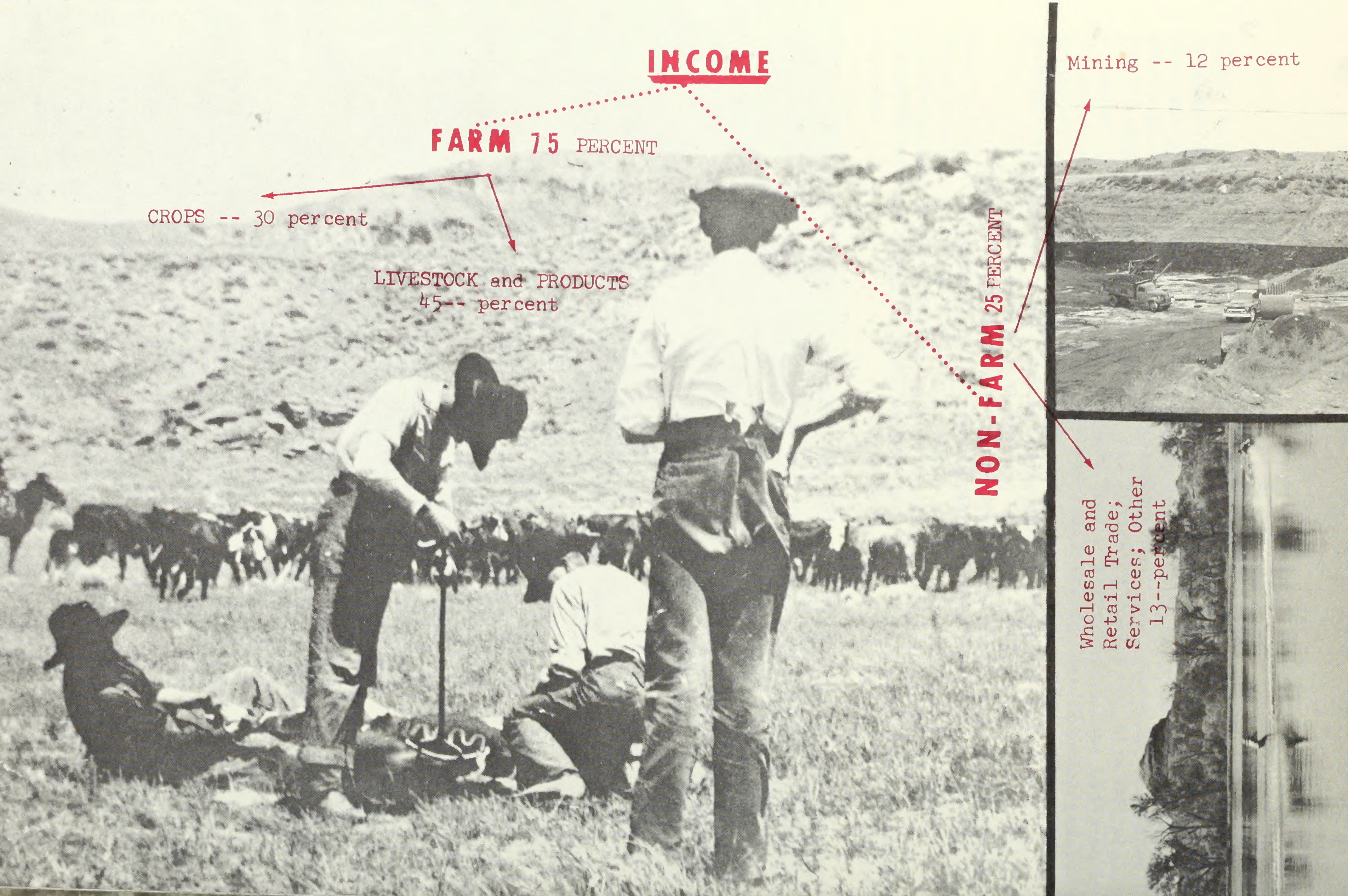
Badlands in the breaks of the Missouri River; Fort Peck Reservoir in background. Photograph, U.S. Army, Corps of Engineers


INCOME
FARM 75 PERCENT
CROPS -- 30 percent
LIVESTOCK and PRODUCTS 45-- percent
NON-FARM 25 PERCENT
Mining -- 12 percent
Wholesale and Retail Trade; Services; Other 13--percent

Transportation and Communication

The early Indians plodded across the open miles of prairie accompanied by dogs drawing travois. The sudden advent of the horse from the south, introduced by the Spanish, changed the Indian tribes into highly mobile units. The first white man remained in much the same primitive state. On the river, however, keel boats and pirogues, hauled or rowed by hand, transported furs and supplies. Then, in the mid-1800's a new form of transportation arrived -- steamboat travel along the Missouri and Yellowstone Rivers. With the coming of the railroads, which were far more dependable, the steamboat was soon replaced.

Today, a branch line of the Burlington Northern runs from Glendive through Circle to Brockway in the central part of the report area. The east-central part is covered by a branch line, extending from Sidney to Richey; the railroad also traverses the extreme eastern tip, crossing at Nohly, Montana. The western half of the area has no direct rail service.

Total highway traffic (both passenger and truck) for all through highways averages about 1,000 vehicles in one 24-hour period. The heaviest traffic flow is on State Highway 200 through Circle and Jordan. Light traffic crosses the area on State Highways 13, 16, 200S, 22, and 24. These are all-weather highways. Graveled and graded farm-to-market roads serve most of the area.

Commuter airlines connect the cities of Sidney, Miles City, Glasgow, Glendive, Wolf Point, and Williston, North Dakota.

Commerce, Trade, and Community Services

Income from sales and service enterprises ranks second to agriculture. In 1958, Garfield and McCone Counties had 51 retail sales establishments with gross sales of $3.5 million, a decrease of almost $1 million from 1954. This represents a stabilizing effect as the Williston Oil Fields settled down to normal operation. Between 1954 and 1958 personal services industries, such as lodging and automobile services, increased from 17 to 21 establishments, with total sales volumes of over $200,000, an increase in sales of nearly 10 percent.

The Fort Peck Dam and Reservoir, along the north boundary, is an outstanding multiple-purpose water-resources development. Now complete, except for construction of additional recreational facilities, its total estimated cost is $157,415,000. In direct benefits, this project contributes approximately $13,190,000 annually, with $4,600,000 credited to flood control, $5,120,000 to power generation, $1,620,000 to navigation, $1,820,000 to irrigation, and $23,000 to leases.

One- and two-teacher elementary schools are scattered through the isolated rural areas. Most rural high school students are transporte by bus to school or move into town to complete their high school work.

Retail and wholesale stores, as well as medical services, are concentrated in the county seats at Jordan and Circle.

Natural gas comes from outside the area by private pipeline; a network of private and public power lines provides electricity. Most of the rural sections are supplied with electricity and telephone service by local cooperative systems.

Outdoor Recreation

Tourists, and local residents particularly, enjoy fishing, hunting, sightseeing, archeology, and rockhounding.

Big game hunters are attracted by large populations of mule deer, whitetail deer, and antelope. Upland game birds include Hungarian partridge, sharptail grouse, sage grouse, and ringneck pheasant. Waterfowl breed in the Charles M. Russell National Wildlife Refuge. Migrator birds pass through in seasonal migrations.

BELOW Hell Creek State Park, twenty-five miles north of Jordan, Montana, one of three named State Parks on Fort Peck Reservoir. Photograph U.S. Army, Corps of Engineers

Looking west up the 175 mile long Fort Peck Reservoir, Big Dry Creek-Montana Pumping Area is on the left. Photograph, U.S. Army, Corps of Engineers

The Charles M. Russell National Wildlife Refuge surrounds Fort Peck Lake. This lake is the world's fourth largest man-made reservoir. It is created by the world's largest hydraulic earth-fill dam, built between 1933 and 1940. Fort Peck Lake has good boating and fishing. Two State Parks, Rock Creek and Hell Creek, are both accessible over dirt roads and have camping and launching facilities. The shoreline is as primitive as in 1805, when Lewis and Clark passed by. The Fort Peck Yacht Club sponsors an annual motor-boat trip from Fort Benton to Fort Peck, a 300-mile scenic, historic tour down the river through country seldom seen by visitors. Over the last 10 years, recreation visitor-days at Fort Peck Dam have almost tripled, from 161,000 in 1960 to 475,000 in 1969.

Mining and Minerals

The mineral resources of the Big Dry Creek-Montana Pumping Area include oil, coal, sand and gravel, and bentonite. Returns from mineral products sold during 1968 were about $3 million, with petroleum accounting for most of that amount. The crude oil came from four producing oil fields. Another field is shut down at present. Petroleum production is expected to continue as the major source of mineral income with the crude oil piped to refineries outside the area. Continuing exploration may develop new fields.

Deposits of both sub-bituminous and lignite grades of coal suitable for steam-electric generation are widespread; this coal is suited also to gas synthesis in producing various liquid hydrocarbon fuels. Pilot studies show acceptable coking coal can be obtained from the sub-bituminous deposits. Most of the coals of Montana burn with low rates of air pollution, unlike eastern coals. A new market may result with western coals successfully competing with local coals in eastern cities. No mines are operating in the Big Dry Creek-Montana Pumping Area, but suitable locations for strip mining are known. Coal offers the best prospect for economic production of any local minerals.

Extensive bentonite deposits throughout the area have not been developed. Western bentonite has a ready market as a binder for pelletizing low grade iron ore, as drilling mud in oil wells, and in other industrial applications. Future commercial production is a possibility.

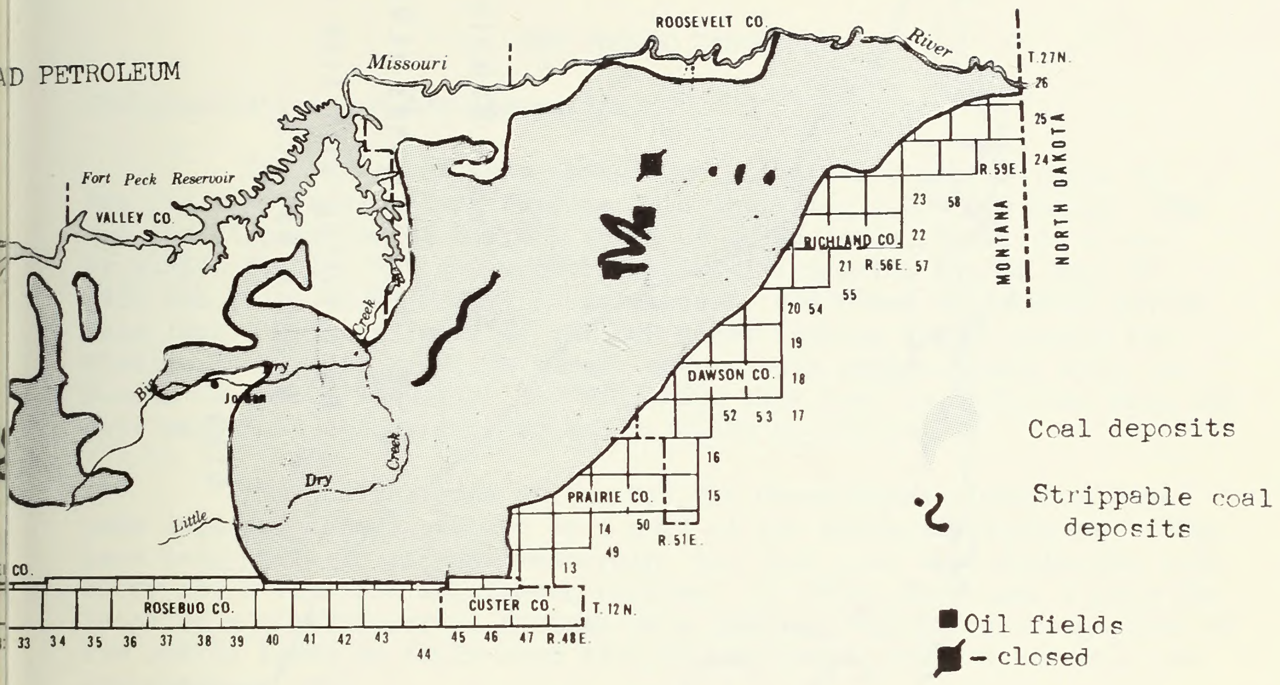
Sands and gravels are used in most construction. Their total value usually ranks higher than that of any other mineral. In this report area, however, construction is minimal and the return to the economy is accordingly low. Deposits are scattered throughout the eastern section in a reserve that can meet the needs of any future expansion.

Economic Outlook

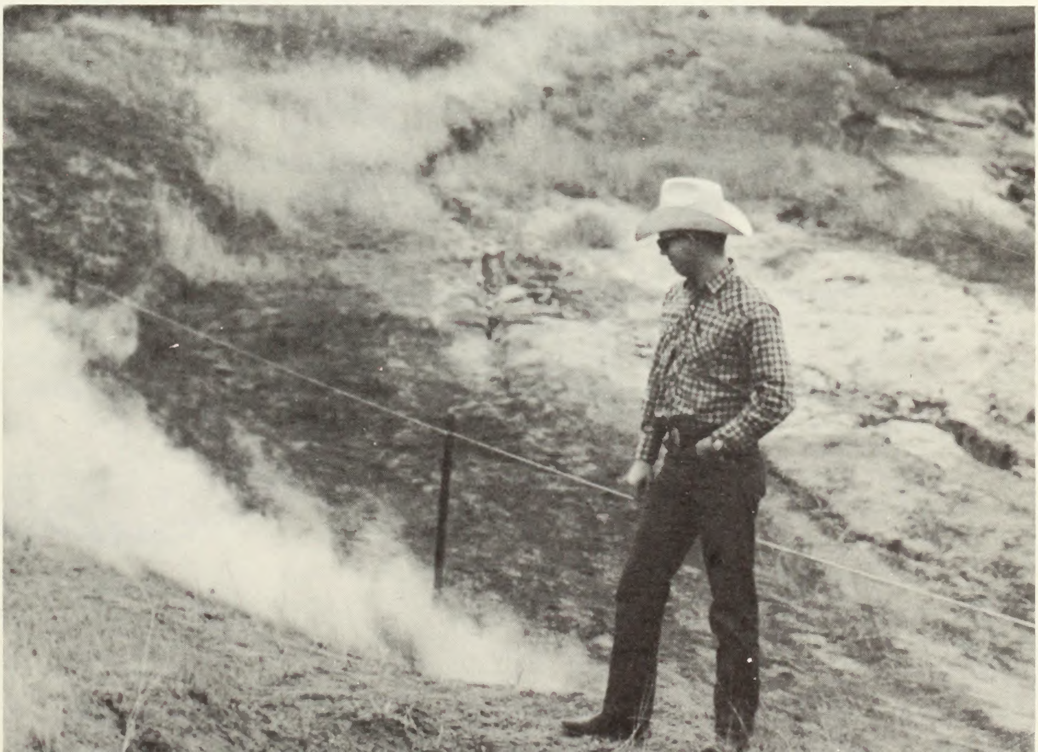
The Big Dry Creek-Montana Pumping Area has attracted little in-migration. It is unlikely to achieve prominence as long as progress is measured in terms of economic development and population growth. If, however, our present rate of "environmental stress" increases on the national scale as expected, then the quiet attractions of this overlooked area will become increasingly important.

For the immediate future, the Big Dry Creek-Montana Pumping Area must depend upon its agricultural capability. Wheat and beef cattle will remain preeminent.

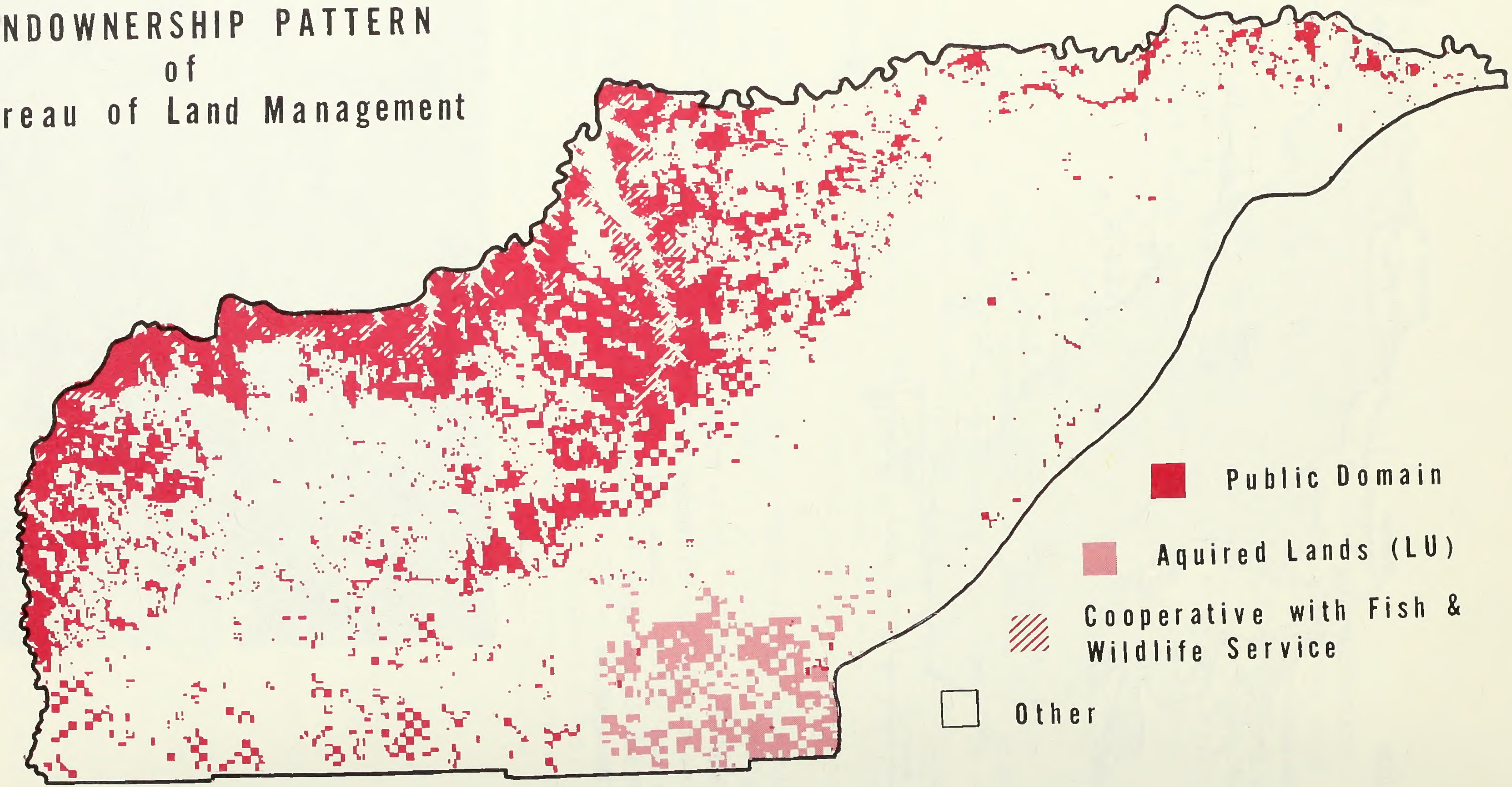
Continued development and management of recreational resources capitalizing on wildlife and the Fort Peck Reservoir will increase the contributions of this segment of the economy.



BELOW
Underground coal fire. Soils slump into the voids created by the fire; wide cracks and fissures mark the subsidence into a valley, like the one below. These fire-caused valleys are common. (Subterranean fires affect topography in other ways, see page 24.) Photograph, Bureau of Land Management



LANDOWNERSHIP PATTERN
of
Bureau of Land Management



THE PUBLIC LANDS

Characteristics and Administration

The Bureau of Land Management administers public lands in the Big Dry Creek-Montana Pumping Area totalling 1,054,000 acres. The use and disposition of 829,000 acres of these lands, known as vacant or public domain, are governed by the Taylor Grazing Act of June 28, 1934 (48 Stat. 1272; USC 315), as amended, and other applicable public land laws. Similar lands of 177,000 acres (public domain within the Charles M. Russell Wildlife Range) are managed cooperatively with the Bureau of Sports Fisheries and Wildlife; this land is withdrawn from all uses except livestock grazing and wildlife production.

The public lands of the Big Dry Creek-Montana Pumping Area came into the Federal estate as a part of the Louisiana Purchase. They have never been in private ownership, nor have they been withdrawn from entry for a specific management program. In 1964, they came within the scope of a classification program on a national scale for designation of the public lands to their best form of management under a multiple use concept.

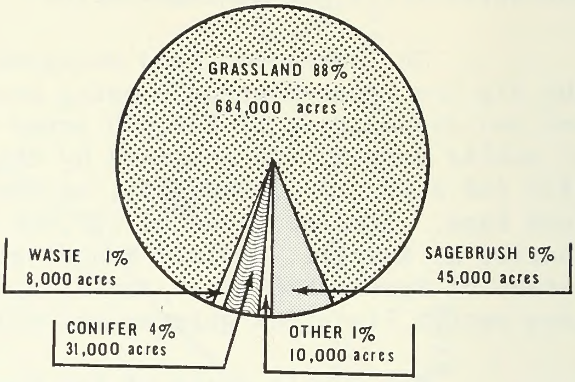
The lands remaining in public ownership are generally those found undesirable by the public. An exception, however, is the Bankhead-Jones Land Utilization lands, totalling 48,000 acres. These were formerly privately owned. They proved to be marginal or sub-marginal farmland, used beyond their land capability during the early decades of this century. They were purchased under the Bankhead-Jones Farm Tenancy Act, and have since been managed by a Federal agency. Laws governing use and disposition of the L. U. tracts differ from those applicable to the other public lands.

Public domain administered by the Bureau of Land Management, totalling roughly 855,000 acres, lies in fairly compact concentrations in the rangelands of the west, northwest, and central sections, and generally on the rough and broken lands along the northern boundaries. Elsewhere the public domain is in a scattered pattern of small, isolated tracts; by definition of the Taylor Grazing Act, a separate parcel of public land containing not more than 1,520 acres is "isolated," thus "isolated tract."

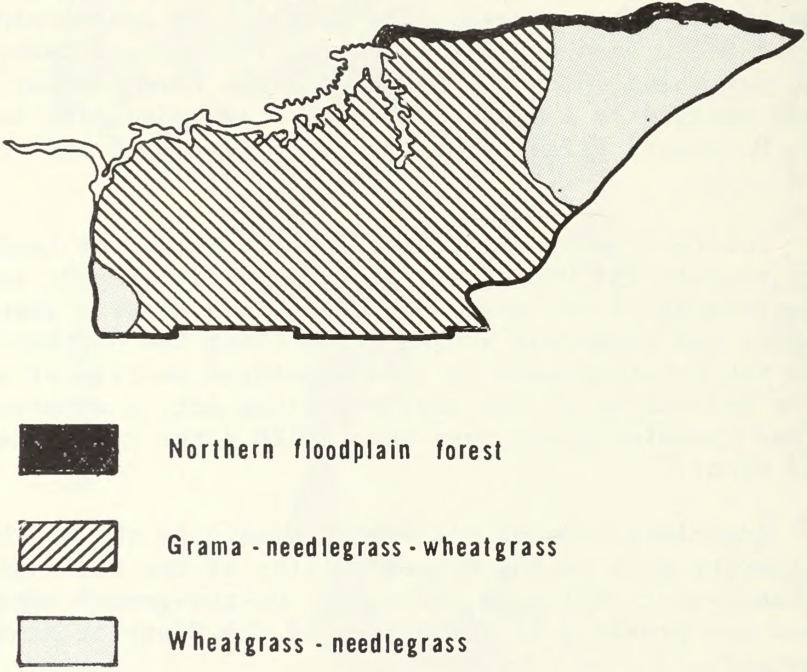
Administration of the public domain in the Big Dry Creek-Montana Pumping Area is the responsibility of the State Director, Bureau of Land Management, Billings, Montana. On-the-ground supervision and management are provided by the Office of the District Manager, Miles City, Montana.

Range Vegetation

The Bureau of Land Management groups rangelands into 18 Standard Range Types based on the aspect that is determined by the dominant plant (Appendix C). Range types have a number and a general name, such as 1-Grassland, 2-Meadow, 4-Sagebrush, etc. If one aspect is dominant but another group of plants is conspicuous, combinations are used, such as 1-4, grassland with conspicuous sagebrush.



Potential Natural Vegetation



(A.W.Küchler, American Geographical Society, 1964, revised U.S. Geological Survey 1965 - U.S. National Atlas.)

In field inventory of range vegetation, each plant is listed automatically in its frequency of occurrence. A frequency listing shows only one fact, that a plant occurs on a field inventory writeup sheet.

In addition, the common forage plants can be ranked by species as to production. This is used to decide which species are important in the grazing economy. In the field, each plant is estimated as to the percentage it makes up of the total forage on a range site. Fifteen percent of the total forage was chosen as the most significant break-off point in ascertaining the relative importance of the individual species.

The following simplified forage description for one range site illustrates both the plant frequency and relative production volume. Nearly 1,300 sites were carefully examined.

Plant Species	Percentage of Total Forage for Range Site
Blue grama	25
Sand dropseed	10
Western wheatgrass	5
Prickly pear	T (any amount less than 5%)
Big sagebrush	60
TOTAL	100

Each of the above plants have a frequency of one, because each one is a component of the plant community on this range site. If they were listed on every one of the 1,300 range site writeups, they would have 100 percent frequency.

Fifteen percent of the total forage production is the significant breakoff point for relative importance of species. Applying this criterion to the above example, the only plants with significant production are blue grama with 25 percent and big sagebrush with 60 percent. The total number of such occurrences in 1,300 writeups gives a useful figure for comparing relative importance, species by species.

Little bluestem's forage value varies. Livestock graze other plants during good years. Thus, little bluestem increases in vigor and thereby creates a reserve that is drawn against during the bad years.

Threadleaf sedge has early spring growth most valuable for forage. It is drought resistant and its fairly low growth habit helps it to sustain heavy grazing.

Fringed sagebrush, big sagebrush, and silver sagebrush are key shrubs totalling 184 percent frequency; this means one or two of these species occur on every range site. The most productive shrub species is big sagebrush. On 11 percent of the range sites it produced 15 percent or more of total forage yield.

For 8 months out of the year, antelope live principally on these three shrubs. Cattle and sheep use big sagebrush and silver sagebrush heavily during the winter. Silver sagebrush is grazed by cattle during the summer. Fringed sagebrush, although valuable to wildlife, is unpalatable to livestock and tends to increase on heavily grazed range. Big sagebrush and silver sagebrush decrease under light use and increase under heavy use. However, the increase or decrease of all three species is related as much or more to weather cycles and the effect of soils, as to grazing pressures. None of the shrubs make a range plant problem. No control measures are needed.

Ponderosa pine and juniper are the principal timber species. They are found on 16 percent of the sites and provide lumber for local building, repairs, and fences.

Forb or weed frequencies run high, at least one species appearing on every inventory site, and more than one species appearing together on a majority of sites. The most common weeds are phlox, 25 percent; globemallow, 15 percent; curlycup gumweed, 12 percent; Erigonum, fleabane, and woolly Indianwheat each have about 11 percent frequency. Sweetclover, 12 percent, is the only forb to contribute more than 15 percent forage, and that happened on only nine sites.

Noxious plants and plants of low palatability are common. Either fringed sagebrush or broom snakeweek are found on every site and are in association on another 25 percent of the sites; prickly pear is found on 50 percent of the range sites. Noxious plants form 15 percent of the vegetation on only seven sites. Cactus and yucca, found on one-fourth of the sites, are more often related to soil conditions than any other single environmental factor.

Lupine, greasewood, and chokecherry are common and potentially poisonous. Lupine has toxic alkaloids; greasewood has toxic oxalates, chokecherry produces hydrocyanic acid in the rumen. Toxicity of all these

Frequency and significant forage production seldom coincide. This is brought out in the following illustration showing the ten plants with the highest significant forage production as they ranked with other plants in the order of their frequency.

Most Important Plant Species (on 1,300 Range Sites.)	Rank by Forage Production of Individual Species (on 1,300 Range Sites. Number of times, by percentage, a species aggregated 15 percent or more of total plant production for each range site.	Individual Rank of Species by frequency
Western wheatgrass	....................69%	1
Blue grama	.................59%	2
Needleandthread	................58%	3
Bearded bluebunch wheatgrass	.............28%	6
Sedge species	...........13%	4
Big sagebrush	...........13%	7
Green needlegrass	........7%	8
Sandberg bluegrass	......5%	15
Little bluestem	.....4%	16
Plains muhly	.....4%	14

Western wheatgrass, bearded bluebunch wheatgrass, needleandthread, and green needlegrass are midgrasses. Their growth starts in late March or early April, and stops between late June and mid-August; growth resumes under the influence of fall rains, but with lessened vigor.

Blue grama is a short grass, productive and palatable. It begins growth in late April and cures in late July and August. In normally moist years it not only bears up well under grazing, but increases its area of distribution. Blue grama escapes grazing pressure by its low growth habit. With excessive grazing pressure, taller grasses bear the heaviest utilization; as they weaken and disappear, blue grama will move into their former niche.

Sandberg blue grass and plains muhly are examples of plants normally ungrazed by livestock. One or the other is found on nearly every range site; they are abundant on 9 percent. Unfortunately, they are of little value to livestock, being both short and unpalatable.

plants varies seasonally. Chokecherry, for example, is toxic only after a frost or severe drought. Livestock poisoning is rare because of the available quality range forage and good livestock management systems.

The most sensitive and accurate indicator of range condition is total plant cover. The original vegetative covering for each range site is first determined by studying protected or well-managed rangelands. Current condition is then evaluated by comparing present vegetation with that originally occupying the site. (See Appendix C for details on range inventory method.) Range condition is expressed as follows:

Excellent	75 to 100% of the original plant cover
Good	50 to 75% of the original plant cover
Fair	25 to 50% of the original plant cover
Poor	0 to 25% of the original plant cover

A range site in "Excellent" condition has, essentially, its original plant cover. The next lower class, "Good," represents small changes in which some percentage of the original plants have been replaced. Lower condition groups, "Fair" and "Poor," represent greater departures from the original plant cover.

Typical "Excellent" and "Good" rangelands have more of the desirable grasses and forbs, greater forage production, and more soil cover of mulch and litter. These factors, however, will vary with the climate and range type. Rangeland in "Fair" and "Poor" condition has less forage production and many of the plants are unpalatable. It is important to note that condition is not directly related to forage production. Badlands can be in "Excellent" condition, but the total forage production is extremely low.

On "Fair" rangeland, the plants may be inferior to those of the original plant cover, but still furnish forage at a season of critical need. Range in "Fair" condition conceivably could be useful and desirable in management of certain range.

"Poor" condition is the lowest class. The original plant cover may be partly or completely replaced by other, often undesirable, vegetation.

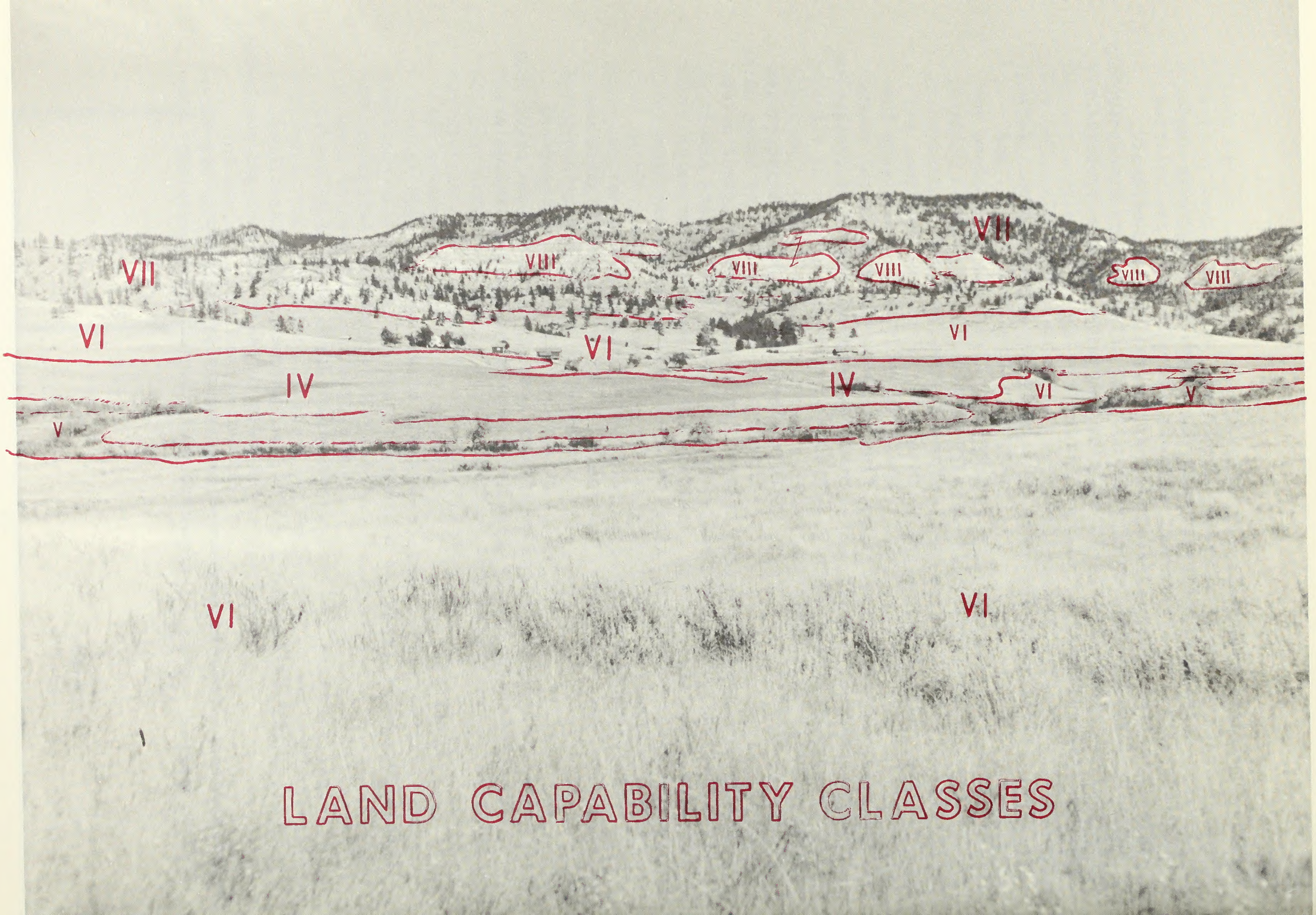
Field examination, as summarized in the following table, disclosed that, ecologically speaking, 98 percent of the public domain is in "Good" or "Excellent" condition. Only 2 percent has changed substantially from the original plant cover species.

PUBLIC DOMAIN:	CONDITION	ACRES	PERCENT
	Excellent	507,000	60
	Good	312,000	38
	Fair	13,000	2
	Poor	2,500	...
	TOTAL	834,500	100

Land Capability Classes

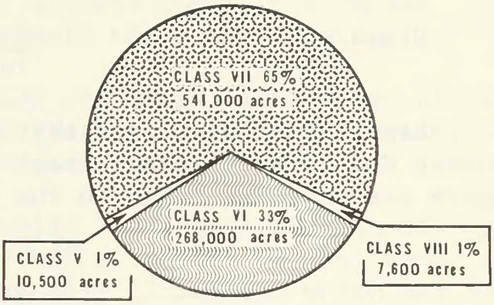
Land capabilities express the limits for long-range, safe, economic land use. Government agencies commonly group capabilities into eight broad classes determined by the soil factors of depth, texture, fertility, degree of slope, length of slope, and susceptibility to erosion. These factors are balanced against long-term production without soil damage.

Classes I - IV	All lands can be cultivated. Soils deep to fairly deep, level, and fertile. Class I soils produce any crop within limits of local climate; Class II require moderate precaution to guard against soil erosion, and maintain fertility. The higher the class number, the greater the management problems and degree of precaution needed.
Class V	This class falls between major groups that can be cultivated, and those which must remain in permanent plant cover. These soils may be deep and nearly level, but cannot be cultivated due to flooding, rockiness, etc.
Class VI	Restricted to permanent, native plant cover. Finds its highest use in production of livestock forage and forage for wildlife, and watershed protection. No restrictions other than good range management practices are needed.
Class VII	Includes soils with increasing use hazards resulting from such factors as increased slope, shallow profile and unstable texture. Restricted to lighter grazing, and greater care in management than Class VI is needed.
Class VIII	At the extreme of land capability. Includes marshes, steep rugged mountains, and barren badlands. Values for wildlife are often high, as are watershed protection and recreational use.



LAND CAPABILITY CLASSES

Sixty-five percent of the public domain has a Class VII land capability, suitable for livestock grazing or timber production with appropriate restrictions. Class VI land capability comprises 33 percent of the land, suitable for livestock or timber production without significant restriction, 1 percent of the public domain is in Class VIII, restricted to wildlife, and watershed protection. The remaining 1 percent is Class V, areas not cultivated primarily because of recurrent river overflow.



Soil Erosion Classes

Erosion is of two kinds, geological and accelerated. Most erosion is a natural geological process. It is normal, but may be a serious problem in land and water quality management.

The southwestern part of the Big Dry Creek-Montana Pumping Area, corresponding generally to the Grumosol soils, is subject to rapid geological erosion because of unstable soils. This is an area sometimes classed as "frail lands." Erosion results not only from adverse topography, but from soils of swelling clays (montmorillinites) that are responsible for erosion (usually piping), sedimentation, and water quality problems. Ordinary erosion control measures are ineffective on such sites.

Geological erosion is distinct from accelerated erosion. Accelerated erosion is loss of soil at a more rapid rate than normal. Among its causes are fire, logging, construction, or other agency of disturbance that bares the soil or removes the plant cover.

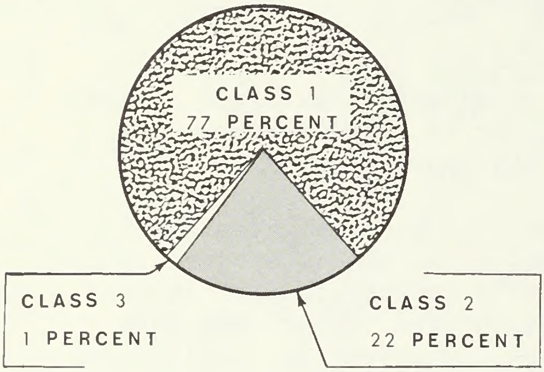
The relative severity of accelerated erosion is described as:

Class 1	None to slight. Almost undetectable.
Class 2	Slight to moderate. In mature soils, 3/4 of the "A" horizon gone; in structureless soils, to 3 to 4 inches gone; rills widespread; small gullies common.

Class 3	Moderate to severe. In mature soils, the entire "A" horizon gone; in structureless soils, top 5 inches gone; gullies large and deep.
Class 4	Severe. So severe as to change the landscape; many large, deep gullies.

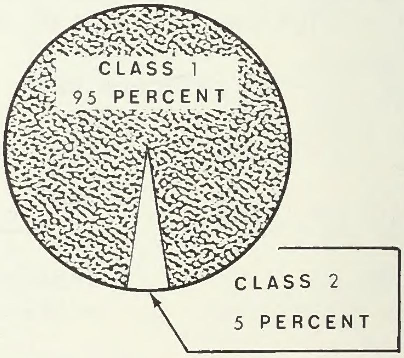
Examination discloses that public lands have relatively minor soil losses due to accelerated erosion. Approximately 77 percent of the lands were evaluated as being in the Class 1 water erosion, none to slight.

Water erosion produced Class 2, slight to moderate damage, on 22 percent of the public land and Class 3, moderate to severe on the remaining 1 percent. A very small amount had Class 4, severe erosion.


WATER EROSION

Wind erosion was negligible with 95 percent of the public lands being evaluated as Class 1, and the remaining 5 percent as Class 2. A very small amount had Class 3 and 4 erosion.

The relative freedom of public lands from accelerated erosion is attributed mainly to management which assures that use of the land will be limited to its natural capability.


WIND EROSION

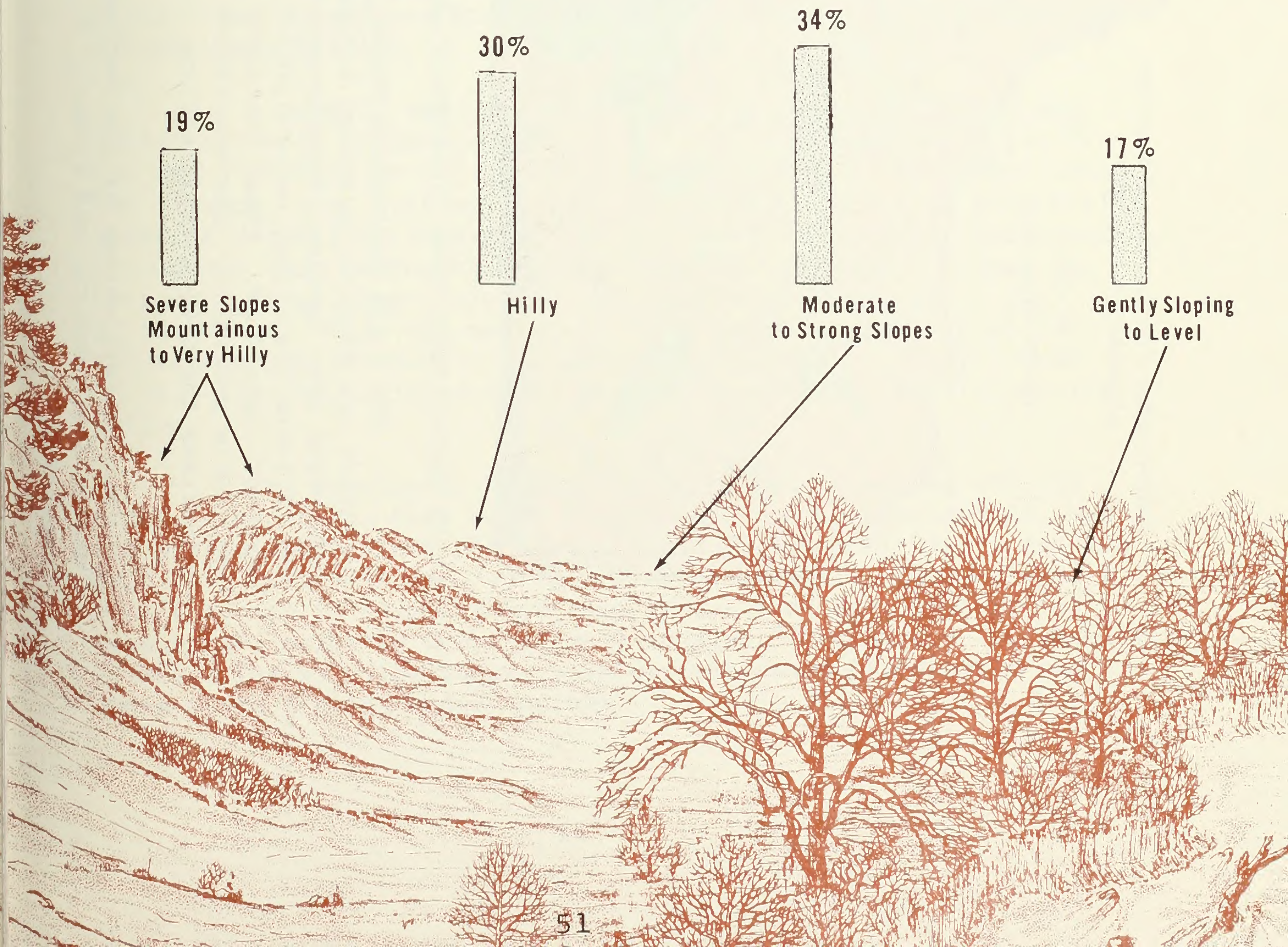
Land Slope Classes

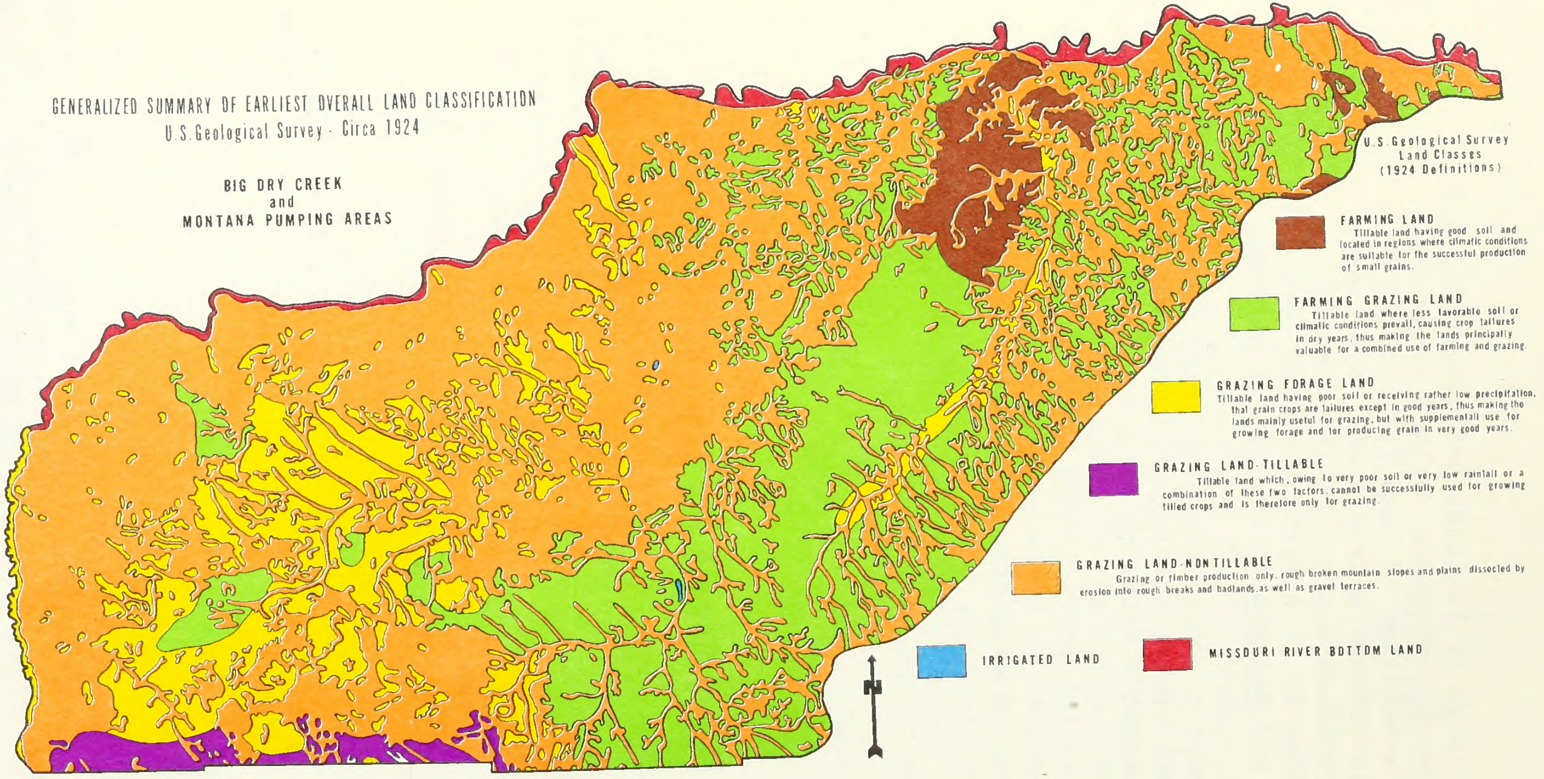
Within the overall limits of latitude and elevation, the degree of slope exerts an important influence on land capability. Slope determines the physical useability of land for cultivation, grazing and other purposes. It affects microclimate, and thereby vegetation, soil development, erosion susceptibility, and forage production. Combined with exposure, it affects the life form and species of plants and animals and helps mold the entire ecology.

Predominantly the public lands are rough with steep slopes and shallow soils. These lands support grazing, wildlife and watershed, but are not adapted to more intensive forms of use.

Thirty-four percent of the public lands have pronounced slopes, 30 percent are characterized by hills, and 19 percent have slopes ranging upward to severe, leaving only 17 percent which can be classed as gently sloping.

Slope Classes by Percent for Public Domain and Acquired (LU) Lands




GENERALIZED SUMMARY OF EARLIEST OVERALL LAND CLASSIFICATION
U.S. Geological Survey - Circa 1924
BIG DRY CREEK
and
MONTANA PUMPING AREAS
U.S. Geological Survey
Land Classes
(1924 Definitions)
FARMING LAND
Tillable land having good soil and located in regions where climatic conditions are suitable for the successful production of small grains.
FARMING GRAZING LAND
Tillable land where less favorable soil or climatic conditions prevail, causing crop failures in dry years, thus making the lands principally valuable for a combined use of farming and grazing.
GRAZING FORAGE LAND
Tillable land having poor soil or receiving rather low precipitation, that grain crops are failures except in good years, thus making the lands mainly useful for grazing, but with supplementall use for growing forage and for producing grain in very good years.
GRAZING LAND-TILLABLE
Tillable land which, owing to very poor soil or very low rainfall or a combination of these two factors, cannot be successfully used for growing tilled crops and is therefore only for grazing.
GRAZING LAND-NONTILLABLE
Grazing or timber production only, rough broken mountain slopes and plains dissected by erosion into rough breaks and badlands, as well as gravel terraces.
IRRIGATED LAND
MISSOURI RIVER BOTTOM LAND
N

Early Agricultural Land Classification (Circa 1924) 1/

The U. S. Geological Survey, 1924-1929, made a study of the Northern Great Plains by potential-use classes; grazing, irrigation farming, and dry-farming. Dry-farming lands were subdivided into farming, farming-grazing, and grazing-forage. Grazing lands were tillable or non-tillable ("grazing, non-tillable" included timber). National Forests and National Parks were not classified. These standards are defined in Appendix B. The USGS findings are still applicable generally. The vegetation changed moderately, the soils little. The above map summarizes the USGS classification.

1/ Land Classification of the Northern Great Plains, Montana, North Dakota, South Dakota, and Wyoming, U. S. Geological Survey 1929. Unnumbered.

Note: Currently accepted standardized plant names are substituted

Classification and Multiple Use Act

The Classification and Multiple Use Act of September 19, 1964 (PL 88-607) (78 Stat. 986; 43 U.S.C., 1411-1418) directed the Department of the Interior to determine, within the criteria of the Act, those public domain lands suitable either for disposal or for retention in federal ownership under interim management. This act expired 6 months after the final report of the Public Land Law Review Commission to Congress on June 23, 1970. All proposals to classify public lands for multiple use management under this authority were necessarily published in The Federal Register on or before December 23, 1970. Expiration of the act did not affect other authorities for classification of the public lands, nor the petition-application system. Emphasis is still on public participation in planning and in classification of public lands for disposition.

The map backing this page shows classification actions under the act. Cross hatching in black lines depict the final limit of public domain for retention or cooperative management.

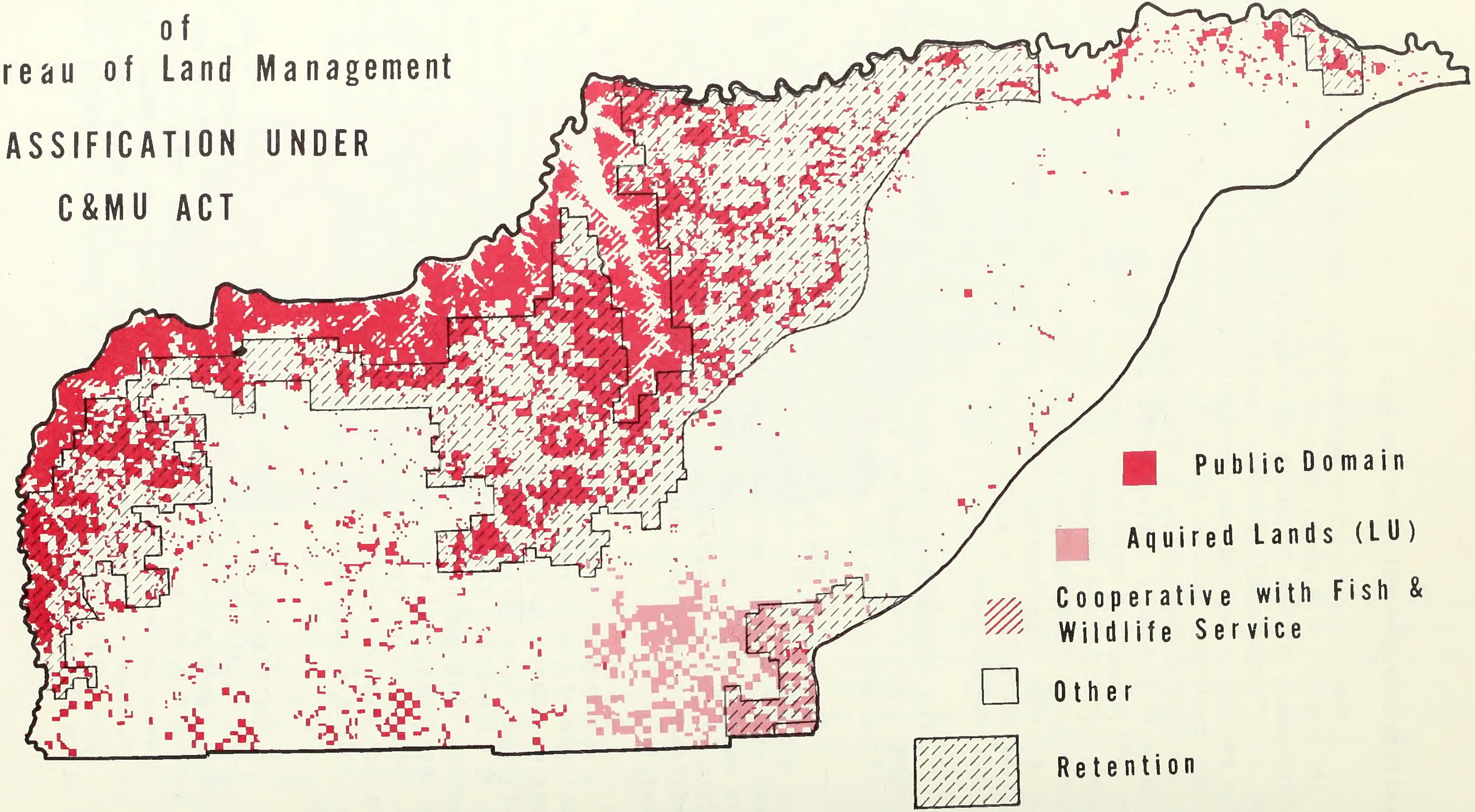
The public lands, roughly 860,000 acres out of a total of 5.8 million acres in the Area, lie in two general public domain concentrations along the breaks of the Musselshell and the Missouri Rivers and LU lands on the southeastern boundary. The land pattern and differences in physical and economic environments direct their classification and use within the restrictions of the Classification and Multiple Use Act.

A careful analysis of all the physical, economic, and social criteria enumerated in the Classification and Multiple Use Act was discussed in public meetings before final action was taken. The climate, past history of use, the varied recreation potentials, areas of scientific interest, the soils and topography, indicated in summary that extensive, rather than intensive (i.e., grazing, permanent range, and recreation as opposed to farming) of the public domain lands was mandatory. An important additional consideration was the public domain land patterns are best-blocked or well-blocked, which fosters easy management and public participation.

The Charles M. Russell Wildlife Range, around 900,000 acres, lies within this heavy concentration of public domain, but its public lands along the Missouri and Musselshell Rivers and the Fort Peck Reservoir are segregated by withdrawal. The pattern of public domain is best-blocked; its specialized use, however, as game range, makes it cooperatively managed. Recreation opportunities abound. The wildlife range contains five named State Parks and three State fishing access points.

LANDOWNERSHIP PATTERN
of
Bureau of Land Management

CLASSIFICATION UNDER
C&MU ACT



Internationally known fossil deposits of the large dinosaurs were known and thus included. Certain concentrations of public domain, however, were not classified by the deadline of December, 1970. These lands will be handled by other classification authorities.

Recommendation on Public Domain

The Bureau of Land Management uses the term "Land Classification" as approval for a change in ownership or management, including suitability for transfer of administration to another public agency. Such classification of land is made only by an authorized officer of the Bureau of Land Management under authority of one of the public land laws. In this study, the field personnel had no authority to classify lands for a change in status, although their work incorporated the basic information needed for formal classification. "Classification", used in this report is thus, classfication in a technician's sense, rather than classification by administrative action.

Of the 829,000 acres of public land inventoried in the Big Dry Creek-Montana Pumping Area, 677 individual parcels aggregating 147,000 acres occur as isolated tracts. (As defined in the Taylor Grazing Act, an isolated tract contains no more than 1,520 acres); 124 parcels with 48,000 acres were not public domain but acquired lands, purchased under Bank Head Jones Act (Land Utilization Projects); of the isolated tracts of public domain, 45,000 acres in 220 parcels were considered to be best suited to retention in public ownership; the rest, 328 tracts with 41,200 acres, had characteristics favoring transfer out of public ownership. These findings, in summary, are in Appendix A. Thirty-five isolated tracts, totaling 7,483 acres were transferred out of Federal ownership between the time of field examination and the publication of this report.

Public domain, other than isolated tracts, aggregated 682,000 acres in the Big Dry Creek-Montana Pumping Area Subbasin. These lands, were inventoried, but not described individually in Appendix A as are the isolated tracts. Information is reported instead on township tabulations and aerial photographs.

Detailed narrative reports, maps and photographs of the findings are on file in the Bureau of Land Management District Office at Miles City, Montana, and at the Bureau's Denver Service Center.

APPENDIX A

Summary of Isolated Tract Inventory

Appendix A - Description, classification of suitability and proposed management of the public domain, by township and range, within the Isolated Tract Classification areas of the Big Dry Creek - Montana Pumping Area, Montana.

Introduction

Where the public domain land pattern was one of a small acreage of public domain scattered through a predominantly private and state ownership, the land was inventoried and classed as isolated tracts. The following table, summarizes inventory findings by individual tract. These findings, upon conclusion of the inventory, were forwarded to the appropriate District Office.

Of the 87,134 acres listed here, approximately 45,900 acres were evaluated as being best suited for retention and management in public ownership. Another 41,200 acres were considered best suited to disposal. Between the time of field inventory, and publication of this report, about 7,500 acres were disposed of pursuant to Land Classification programs of the agency.

Another 48,000 acres are LU lands, similar in size to isolated tracts, but, differing in being acquired lands (Bankhead-Jones Act). These are listed separately in this table.

Note: The material in the tables has been covered in the previous text, with the exception of the numbers in the columns"Present Land Use" and "Principal Suitability". The numerals which denote this land use and suitability are: 1. Grazing: 2. Cropland: 3. Recreation: 4. Wildlife: 5. Mining: 6. Watershed: 7. Timber: 8. Human Occupancy and Industrial Development: 9. Access and Preservation of Public Values: 10. Submerged. "PSW" identifies a Power Site Withdrawal; "SDW" a Stock Driveway Withdrawal; "Rec" a Recreation Site Withdrawal; and "PWR" a Public Water Withdrawal.

Dawson County

Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Present Land Use	Land Capability Classification	Principal Suitability	Proposed Management
MP	21N	51E	18	Lot 4	38.97	Mod. to strongly rolling	7	1-4-6	VII/39	1-4-6	Public
MP	21N	51E	20	W½NW¼;E½SW¼;S½SE¼	240.00	Mod. to strongly rolling	57	1-4-6	VII/240	1-4-6	Public
MP	21N	51E	28	N½NW¼;SE¼NW¼;S½NE¼;NE¼SE¼	240.00	Mod. to strongly rolling	47	1-4-6	VII/240	1-4-6	Public
MP	21N	52E	4	Lot 4	40.00	Mod. to strongly rolling	11	1-4-6	VII/40	1-4-6	Private
MP	22N	50E	8	NW¼NW¼;S½SW¼;SW¼SE¼	160.00	Gently to strongly rolling	28	1-4-6	V/15;VII/145	1-4-6	Private
MP	22N	50E	10	NW¼NW¼	40.00	Gently to strongly rolling	11	1-4-6	V/25;VII/15	1-4-6	Private
MP	22N	50E	24	S½SW¼	80.00	Strongly sloping range	14	1-4-6	VII/80	1-4-6	Private
MP	22N	50E	32	SE¼SE¼	40.00	Mod. to strongly rolling	11	1-4-6	VII/40	1-4-6	Private
MP	22N	50E	34	SW¼SW¼	40.00	Gently to strongly rolling	7	1-4-6	VII/40	1-4-6	Private
~~MP~~	~~22N~~	~~51E~~	~~24~~	~~SW¼SW¼~~	~~40.00~~	~~Gently to mod. rolling~~	~~15~~	~~1-4-6~~	~~VI/40~~	~~1-2-6~~	~~Private~~

Garfield County

Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Present Land Use	Land Capability Classification	Principal Suitability	Proposed Management
BD	13N	34E	12	All	640.00	Mod. rolling grassland	83	1-6	VI/27;VII/613	1-6	Public
BD	13N	34E	14	S½	320.00	Level to mod. rolling	45	1-6	VII/320	1-6	Public
BD	13N	34E	22	S½	320.00	Level to moderately rolling grassland	33	1-6	VII/320	1-6	Public
BD	13N	34E	24	All	640.00	Level to moderately rolling grassland	81	1-4-6	V/42;VII/598	1-4-6	Public
BD	13N	35E	18	All	636.12	Mod. rolling grassland	72	1-4-6	VII/636	1-6	Public
BD	13N	35E	20	SW¼;W½NW¼;NE¼NW¼;SW¼SE¼	320.00	Nearly level to moderately rolling grassland	23	1-6	VII/320	1-6	Private
BD	13N	36E	4	Lots 1,2;SE¼NE¼;NE¼SE¼; SW¼	320.48	Mod. to steeply rolling grass - sage range	78	1-4-6	V/25;VII/295	1-4-6	Public
BD	13N	36E	6	Lots 1,2;S½NE¼;NE¼SE¼; Lots 6,7;SE¼SW¼	323.12	Gently to mod. rolling sagebrush - grassland	98	1-6	VII/323	1-4-6	Public

Dawson County

Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Present Land Use	Land Capability Classification	Principal Suitability	Proposed Management
MP	17N	50E	6	Lots 5,6	77.30	Steep grassland range	6	1-4-6	VII/77	1-4-6	Private
MP	17N	50E	6	SW¼SE¼	40.00	Mod. rolling grassland	11	1-4-6	VII/40	1-4-6	Private
MP	18N	50E	28	S½	320.00	Steep, grassland, range	28	1-4-6	VII/320	1-4-6	Private
MP	18N	51E	6	Lots 4-7	157.28	Steep to very steep breaks	12	1-4-6	VII/30;VIII/127	1-3-4-6	Public
MP	19N	50E	4	SW¼SE¼	40.00	Strongly rolling range	6	1-4-6	VII/40	1-4-6	Private
MP	19N	50E	6	Lots 6,7	70.86	Moderately rolling	12	1-4-6	VII/71	1-3-6	Private
MP	19N	51E	2	Lot 1	39.89	Strongly rolling grassland	7	1-4-6	VII/40	1-4-6	Private
MP	19N	51E	4	W½SW¼	80.00	Strongly rolling grassland	11	1-4-6	V/13;VII/67	1-2-6	Private
MP	19N	51E	8	SE¼SE¼	40.00	Steep grassland range	7	1-4-6	VII/40	1-4-6	Private
MP	19N	51E	10	E½E½;W½SW¼;SE¼SW¼;SW¼SE¼	320.00	Strongly rolling to steep	64	1-4-6	VII/320	1-4-6	Public
MP	19N	51E	20	E½	320.00	Mod. rolling to steep	64	1-4-6	VII/320	1-3-4-6	Public
MP	19N	51E	28	N½NW¼;SW¼NW¼;NW¼SW¼	160.00	Mod. rolling to steep	17	1-4-6	VII/55;VIII/105	1-3-4-6	Public
MP	19N	51E	32	NE¼SE¼	40.00	Mod. to strongly rolling	11	1-4-6	VII/40	1-4-6	Private
MP	19N	52E	6	Lots 1,2;S½NE¼	160.00	Strongly rolling to steep	29	1-4-6	VII/160	1-4-6	Private
MP	20N	51E	32	SW¼SE¼	40.00	Mod. to strongly rolling	11	1-4-6	VII/40	1-4-6	Private
MP	20N	51E	34	NW¼NW¼	40.00	Strongly rolling	6	1-4-6	VII/40	1-4-6	Private
~~MP~~	~~20N~~	~~52E~~	~~32~~	~~W½SW¼~~	~~80.00~~	~~Strongly rolling to steep~~	~~14~~	~~1-4-6~~	~~VII/80~~	~~1-4-6~~	~~Private~~
MP	21N	50E	2	W½SW¼	80.00	Gently to strongly rolling	19	1-4-6	VII/80	1-4-6	Private
MP	21N	50E	28	SW¼SW¼	40.00	Strongly rolling rangeland	7	1-4-6	VII/40	1-4-6	Public
MP	21N	51E	10	NE¼NE¼	40.00	Gently to strongly rolling	11	1-4-6	V/15;VII/25	1-4-6	Public

Garfield County

Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Present Land Use	Land Capability Classification	Principal Suitability	Proposed Management
BD	13N	36E	8	E½	320.00	Level to rolling, clay soil grass - sage range	62	1-6	VI/150;VII/170	1-4-6	Public
BD	13N	36E	10	S½S½	160.00	Level to rolling clay pan-spots, grass-sage range	28	1-6	V/32;VII/128	1-4-6	Public
BD	13N	36E	14	All	640.00	Gentle slopes to rolling grass - sagebrush	91	1-4-6	VII/640	1-4-6	Public
BD	13N	36E	22	NW¼;N½NE¼;N½SW¼	320.00	Gentle to mod. rolling grass - sagebrush range	57	1-6	V/15;VII/305	1-4-6	Public
BD	13N	36E	24	W½	320.00	Mod. slopes, clay soil sagebrush range	25	1-6	VII/320	1-4-6	Public
BD	13N	37E	2	All	643.20	Nearly level to gently rolling grassland	112	1-6	VII/643	1-6	Private
BD	13N	37E	4	Lots 1,2,3,4; S½NW¼;S½NE¼	321.68	Hilly grassland range	55	1-6	VII/322	1-4-6	Public
BD	13N	37E	6	Lots 1,2,3,4,5;S½NE¼; SE¼NW¼	320.94	Rolling grassland hills	69	1-6	VII/321	1-4-6	Public
BD	13N	37E	8	W½W½;E½E½	320.00	Gentle to mod. rolling grassland-saltbush range	49	1-6	VII/320	1-6	Public
BD	13N	37E	12	SE¼SW¼;E½E½;W½SE¼;SW¼NE¼	320.00	Gentle to mod. rolling grassland range	53	1-6	VI/82;VII/238	1-4-6	Public
BD	13N	37E	14	SE¼SE¼;NE¼;NE¼NW¼;N½SE¼	320.00	Gently sloping clay soiled grassland	54	1-6	VII/320	1-4-6	Public
BD	13N	37E	18	E½	320.00	Gently sloping clay soiled grassland	61	1-6	VI/46;VII/274	1-6	Public
BD	13N	37E	20	E½NE¼;W½NW¼;SE¼NW¼; N½SW¼;NE¼SE¼	320.00	Gently sloping clay soiled grassland	57	1-6	VII/320	1-6	Public
BD	13N	37E	24	N½	320.00	Gently sloping clay soiled grassland	54	1-6	VII/320	1-4-6	Public
BD	13N	38E	4	All	643.04	Gentle to steep sloping grassland	151	1-6	VI/244;VII/399	1-4-6	Public
BD	13N	38E	6	Lot 1;SE¼NE¼;E½SW¼;SE¼	320.31	Rolling clayey soiled grassland range	47	1-6	VII/321	1-4-6	Public
BD	13N	38E	8	All	640.00	Gently sloping - moderate rolling grassland range	122	1-6	VI/228;VII/412	1-4-6	Public
BD	13N	38E	10	N½	320.00	Rolling grassland range	86	1-6	VII/320	1-4-6	Public
BD	13N	38E	14	S½	320.00	Gentle slopes, clay soils grassland	53	1-6	VII/320	1-4-6	Public
BD	13N	38E	18	All	638.04	Nearly level-mod. rolling grass-saltbush-sage	117	1-6	VI/277;VII/361	1-4-6	Public

Garfield County

Subbasin	TWP	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Present Land Use	Land Capability Classification	Principal Suitability	Proposed Management
BD	13N	38E	20	All	640.00	Level to gently rolling grassland	122	1-6	VI/272;VII/368	1-4-6	Public
BD	13N	38E	22	N½	320.00	Gentle slopes, clay soils grassland	53	1-6	VII/320	1-4-6	Public
~~BD~~	~~13N~~	~~39E~~	~~6~~	~~Lot 4~~	~~45.39~~	~~Moderate to strongly sloping - grassland~~	~~13~~	~~1-4-6~~	~~VI/25;VII/20~~	~~1-4-6~~	~~Public~~
~~BD~~	~~13N~~	~~39E~~	~~10~~	~~E½~~	~~320.00~~	~~Moderate to strongly rolling grassland~~	~~89~~	~~1-6~~	~~VII/320~~	~~1-4-6~~	~~Public~~
BD	13N	39E	18	SE¼	160.00	Gently sloping grassland range	64	1-6	VII/160	1-4-6	Public
BD	13N	39E	20	SW¼	160.00	Gently sloping grassland range	78	1-6	VI/ 23;VII/137	1-4-6	Public
BD	13N	40E	4	Lots 3,4;SE¼NW¼;E½SE¼; SW¼SE¼	239.40	Gentle to mod. rolling grassland	82	1-6	VI/202;VII/37	1-6	Private
BD	13N	40E	10	SW¼NE¼;SW¼;W½SE¼;SE¼SE¼	320.00	Strong to steeply rolling grassland	61	1-6	VI/22;VII/225; VIII/95	1-6	Private
BD	13N	40E	20	E½	320.00	Moderate to strongly rolling grassland range	67	1-6	VI /165;VII/155	1-6	Private
BD	13N	41E	2	Lots 3,4;S½NW¼;SW¼	320.03	Moderate to steep grassland range	98	1-6	VII/320	1-6	Public
BD	13N	41E	4	Lots 1,2;S½SW¼;SE¼	319.72	Mod. rolling to steep grassland range	88	1-6	VII/320	1-6	Public
BD	13N	41E	6	Lots 5,6,7;E½SW¼;W½SE¼; SE¼SE¼	315.58	Mod. rolling to steep grassland range	53	1-6	VII/316	1-4-6	Public
BD	13N	41E	8	All	640.00	Mod. rolling to steep grassland range	182	1-6	VII/640	1-4-6	Public
BD	13N	41E	10	N½	320.00	Mod. rolling to steep grassland range	77	1-6	VII/320	1-4-6	Public
BD	13N	41E	18	Lot 1;NE¼NW¼;NE¼; E½SE¼	319.05	Mod. rolling to steep grassland range	71	1-6	VII/319	1-4-6	Public
BD	13N	41E	30	All	641.04	Mod. rolling to steep grassland range	138	1-6	VII/641	1-4-6	Public
BD	13N	44E	2	Lot 4	39.25	Mod. rolling grassland	13	1-6	VII/39	1-6	Private
BD	14N	34E	4	Lot 1; SE¼NE¼;NE¼SE¼	120.18	Strong sloped grassland	33	1-6	VII/120	1-6	Private
~~BD~~	~~14N~~	~~34E~~	~~24~~	~~S½~~	~~320.00~~	~~Steep sloped grassland range~~	~~48~~	~~1-6~~	~~VII/320~~	~~1-4-6~~	~~Public~~
BD	14N	34E	26	E½	320.00	Steep sloped grassland range	48	1-6	VII/320	1-4-6	Public

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Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Present Land Use	Land Capability Classification	Principal Suitability	Proposed Management
~~BD~~	~~14N~~	~~35E~~	~~4~~	~~Lots 3,4;SW¼NW¼;NW¼SW¼; SE¼~~	~~320.04~~	~~Strongly rolling grassland range~~	~~76~~	~~1-6~~	~~VII/320~~	~~1-6~~	~~Private~~
~~BD~~	~~14N~~	~~35E~~	~~30~~	~~Lots 1,2,3,4;E½W½~~	~~313.84~~	~~Steeply sloping grassland~~ range	~~47~~	~~1-6~~	~~VII/314~~	~~1-4-6~~	~~Public~~
BD	14N	36E	4	Lots 1,2,3,4;S½S½	322.36	Mod. to steep rolling grassland range	76	1-6	VII/322	1-4-6	Public
BD	14N	36E	8	E½	320.00	Mod. to steep rolling grassland range	71	1-6	VII/320	1-4-6	Public
BD	14N	36E	10	All	640.00	Strong to steeply rolling grassland range	149	1-6	VII/640	1-4-6	Public
BD	14N	36E	12	W½W½;NE¼NW¼;N½NE¼;SE¼NE¼	320.00	Strong to steeply rolling grassland range	74	1-6	VI/25;VII/295	1-4-6	Public
BD	14N	36E	22	W½W½;SE¼SW¼;S½SE¼;NE¼NE¼	320.00	Strong to steeply rolling grassland range	74	1-4-6	VII/320	1-4-6	Public
BD	14N	36E	34	S½	320.00	Mod. to steeply rolling grass - sagebrush range	87	1-6	VII/320	1-4-6	Public
BD	14N	37E	1	All	639.92	Mod. to steeply rolling grassland range	219	1-4-6	VI/584;VII/56	1-2-4-6	Private
BD	14N	37E	5	All	641.12	Gently to moderately rolling grassland	173	1-6	VI/170;VII/471	1-4-6	Public
BD	14N	37E	7	All	635.40	Gentle to steep rolling grassland	146	1-6	VI/116;VII/519	1-4-6	Public
BD	14N	37E	10	N½N½;S½S½	320.00	Strongly rolling grassland range	86	1-6	VII/320	1-6	Private
BD	14N	37E	14	W½W½;NE¼NW¼;NE¼SW¼;N½NE¼	320.00	Gentle to strongly sloping grassland	89	1-6	VI/55;VII/265	1-6	Private
BD	14N	37E	18	Lots 2,3	77.54	Grassland strongly rolling	18	1-6	VII/78	1-6	Public
BD	14N	37E	20	N½N½,S½NE¼;N½SE¼;SE¼SE¼	360.00	Strongly rolling grassland range	97	1-6	VII/360	1-4-6	Private
BD	14N	37E	26	NE¼;N½NW¼;N½SE¼	320.00	Strongly rolling to steep grassland	72	1-6	VII/320	1-4-6-9	Public
BD	14N	37E	28	SW¼;W½SE¼;N½NE¼	320.00	Strongly rolling grassland range	87	1-6	VII/320	1-4-6	Private
BD	14N	38E	12	NW¼NE¼	40.00	Gently rolling grassland	10	1-6	VI/5;VII/35	1-4-6	Private
BD	14N	38E	18	NE½NW¼;E½SW¼;S½SE¼; Lot 4;NE¼SE¼;SE¼NE¼	317.75	Gentle to strong sloping grassland	83	1-6	VII/318	1-6	Private
BD	14N	38E	20	S½	320.00	Gentle to strong rolling grassland	88	1-6	VI/15;VII/305	1-6	Public

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Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Present Land Use	Land Capability Classification	Principal Suitability	Proposed Management
~~BD~~	~~14N~~	~~38E~~	~~24~~	~~E½~~	~~320.00~~	~~Mod. to strongly rolling grassland~~	~~95~~	~~1-4-6~~	~~VI/160;VII/160~~	~~1-4-6~~	~~Public~~
BD	14N	38E	28	All	640.00	Gentle to strong sloping grassland	154	1-4-6	VII/640	1-4-6-9	Public
BD	14N	38E	30	All	635.20	Gentle to strong sloping grassland	171	1-4-6	VI/45;VII/590	1-4-6	Public
BD	14N	38E	32	All	640.00	Mod. to strong sloping grassland	110	1-4-6	VII/640	1-4-6-9	Public
~~BD~~	~~14N~~	~~38E~~	~~34~~	~~All~~	~~640.00~~	~~Strong sloping grassland~~	~~173~~	~~1-4-6~~	~~VII/640~~	~~1-4-6-9~~	~~Public~~
BD	14N	39E	28	N½N½;S½NE¼;S½SW¼	320.00	Mod. to strongly rolling grassland	98	1-6	VI/200;VII/120	1-4-6	Public
~~BD~~	~~14N~~	~~39E~~	~~30~~	~~Lot 1;NE¼;NE¼NW¼;S½SE¼~~	~~325.75~~	~~Mod. to strongly rolling grassland~~	~~97~~	~~1-6~~	~~VI/156;VII/170~~	~~1-4-6~~	~~Public~~
BD	14N	39E	32	All	640.00	Mod. to strongly rolling grassland	190	1-6	VI/312;VII/328	1-4-6	Public
BD	14N	40E	8	SE¼SE¼	40.00	Mod. rolling grassland range	8	1-6	VI/12;VII/28	1-4-6	Private
BD	14N	40E	10	NW¼NW¼	40.00	Gently rolling grassland range	12	1-6	VI/40	1-4-6	Private
BD	14N	40E	12	N½	320.00	Mod. to steep rolling grassland	65	1-4-6	VII/228;VIII/92	1-4-6	Public
BD	14N	40E	30	Lots 3,4	77.30	Mod. to strongly rolling grassland	22	1-6	VI/45;VII/32	1-4-6	Private
BD	14N	40E	32	All	640.00	Mod. to gently rolling grassland	206	1-6	VI/453;VII/161; VIII/26	1-6	Private
BD	14N	41E	18	Lot 4;NW¼NE¼;N½SE¼	157.06	Gently rolling to steep badlands, grass range	39	1-6	VI/117;VIII/40	1-6	Private
BD	14N	42E	10	W½	320.00	Mod. rolling grassland range	110	1-6	VI/320	1-6	Private
BD	14N	44E	18	SE¼SW¼	40.00	Mod. rolling grassland range	14	1-6	VI/40	1-6	Private
BD	15N	32E	14	NE¼	160.00	Strongly rolling grassland	43	1-6	VII/160	1-6	Private
BD	15N	32E	20	E½NE¼	80.00	Mod. rolling grassland	26	1-6	V/28;VII/52	1-6	Private
BD	15N	32E	30	Lots 1,2,3,4	143.92	Strongly rolling grassland	29	1-6	VII/144	1-6	Private
BD	15N	34E	2	Lots 1,2,4;N½SW¼;E½SE¼	280.45	Gentle to mod. rolling grassland	70	1-4-6	VI/85;VII/195	1-4-6	Private

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Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Present Land Use	Land Capability Classification	Principal Suitability	Proposed Management
BD	15N	35E	4	SE¼SE¼	40.00	Gently rolling grassland range	11	1-6	VII/40	1-6	Private
BD	15N	36E	4	Lots 1,4;SE¼NE¼;E½SE¼; SW¼NW¼;W½SW¼	320.98	Gently rolling to steep grassland range	90	1-6	VII/321	1-6	Private
BD	15N	36E	6	Lots 6,7;SE¼,E½SW¼	315.90	Steep sloped grassland range	43	1-6	VII/316	1-6	Private
BD	15N	36E	8	E½	320.00	Gentle to steep sloped grassland range	94	1-6	VII/320	1-6	Private
BD	15N	36E	32	E½	320.00	Mod. to steeply rolling grassland	74	1-4-6	VII/320	1-4-6	Public
BD	15N	37E	2	S½	320.00	Gently to mod. rolling grassland	81	1-6	VI/235;VII/85	1-6	Private
BD	15N	37E	6	Lots 1,6,7;E½SW¼;W½SE¼; SE¼SE¼	312.24	Nearly level to mod. rolling grassland	75	1-6	VII/312	1-6	Private
BD	15N	37E	18	Lot 4;SE¼SW¼,S½SE¼;E½NE¼ NE¼SE¼;NW¼NE¼	317.31	Gently to strongly rolling grassland	79	1-6	VII/317	1-6	Private
BD	15N	37E	22	All	640.00	Gentle to steep sloped grassland	133	1-6	VII/640	1-6	Private
BD	15N	37E	24	S½	320.00	Strongly sloped grassland range	94	1-6	VII/320	1-6	Private
BD	15N	38E	2	All	639.60	Strongly rolling grassland	173	1-6	VII/640	1-6	Public
BD	15N	38E	8	N½N½;SW¼NE¼;SW¼NW¼;S½SE¼	320.00	Strongly rolling to steep grassland	80	1-6	VII/320	1-6	Public
BD	15N	38E	10	N½	320.00	Strong rolling grassland range	87	1-6	VII/320	1-6	Public
BD	15N	38E	12	SW¼;N½NW¼;E½SE¼	320.00	Strongly rolling grassland range	86	1-4-6	VII/320	1-4-6-9	Public
BD	15N	38E	18	Lots 1-4;SE¼SW¼;W½NE¼; NE¼NE¼	301.60	Strongly rolling grassland range	89	1-6	VII/302	1-6-9	Public
BD	15N	38E	22	SE¼NE¼;W½SW¼;SE¼SW¼;SE¼	320.00	Strongly rolling grassland range	87	1-4-6	VII/320	1-4-6	Public
BD	15N	38E	24	N½NW¼;SW¼NW¼;SE¼SW¼	160.00	Mod. rolling grassland range	43	1-6	VII/160	1-6	Public
BD	15N	38E	30	Lots 1-3;E½NW¼;W½NE¼; NE¼NE¼	308.04	Mod. rolling grassland range	91	1-6	VII/308	1-6	Private
BD	15N	39E	14	NW¼NE¼;NE¼NW¼	80.00	Strongly rolling grassland range	22	1-6	VII/80	1-6	Public
BD	15N	39E	18	Lots 1,2;E½NW¼;NE¼	329.06	Strongly rolling grassland range	87	1-4-6	VII/329	1-4-6-9	Public

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Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Present Land Use	Land Capability Classification	Principal Suitability	Proposed Management
BD	15N	39E	22	E½E½;SW¼SE¼	200.00	Strongly rolling grassland range	54	1-4-6	VII/200	1-4-6	Public
BD	15N	39E	24	NW¼NE¼;SE¼;SE¼SW¼;E½NE¼	320.00	Strongly rolling grassland range	87	1-4-6	VII/320	1-4-6-9	Public
BD	15N	39E	32	SW¼NW¼;NW¼SW¼	80.00	Strongly rolling grassland range	22	1-6	VII/80	1-6	Private
BD	15N	40E	18	Lot 2;E½NE¼;NW¼NE¼	155.89	Gently to strong rolling grassland range	46	1-6	VI/25;VII/131	1-6	Public
BD	15N	41E	20	SW¼	160.00	Moderately rolling grassland	40	1-6	VI/100;VII/60	1-6	Public
BD	15N	41E	30	Lots 1-4;E½W½	306.80	Mod. to strongly rolling grassland	92	1-6	VI/187;VII/120	1-6-8-9	Public
BD	15N	41E	32	W½	320.00	Mod. rolling grassland	101	1-6	VI/278;VII/42	1-6-9	Public
BD	15N	42E	24	E½	320.00	Mod. rolling grassland	110	1-6	VI/320	1-6	Private
BD	16N	34E	2	Lot 4;SE¼SE¼	72.70	Mod. rolling grassland range	21	1-6	VII/73	1-6	Public
BD	16N	34E	3	Lots 1,2,8	105.46	Mod. rolling grassland range	37	1-6	VI/53;VII/52	1-6	Public
BD	16N	34E	5	Lots 4,10	89.61	Mod. rolling grassland range	25	1-6	VII/90	1-6	Private
BD	16N	34E	6	Lot 1	63.89	Mod. rolling grassland range	17	1-6	VII/64	1-6	Private
BD	16N	34E	8	NE¼SE¼	40.00	Mod. rolling grassland range	12	1-6	VII/40	1-6-9	Public
BD	16N	34E	9	E½SW¼;NW¼SW¼	120.00	Mod. rolling grassland range	36	1-6	VII/120	1-6-9	Public
BD	16N	34E	10	E½NE¼;SE¼SW¼	120.00	Gentle to strongly rolling grass - sage range	36	1-6	VI/60;VII/60	1-6	Public
BD	16N	34E	26	SW¼;W½SE¼;SE¼SE¼;NW¼NW¼	320.00	Gentle to strongly rolling grassland	87	1-6	VII/320	1-6	Private
BD	16N	35E	1	Lots 3,4,12;W½SW¼	183.58	Nearly level to strongly rolling grassland	55	1-6	VI/30;VII/154	1-6	Private
BD	16N	35E	5	Lots 4,12	72.74	Gentle rolling grassland sagebrush range	23	1-6	VI/73	1-6	Private
BD	16N	35E	6	Lot 2;NE¼SE¼;SE¼SW¼	112.61	Gentle to mod. rolling grass - sage range	41	1-6	VI/80;VII/33	1-6	Private
BD	16N	35E	26	N½	320.00	Strongly rolling to steep grassland range	94	1-4-6	VII/320	1-4-6	Private

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BD	16N	38E	5	Lots 1,2,8	89.91	Strong rolling grassland range	26	1-6	VII/90	1-6	Private
BD	16N	38E	6	Lot 1	25.58	Strong rolling grassland range	7	1-6	VII/26	1-2-6	Public
BD	16N	38E	7	Lot 6	36.18	Gently rolling grassland range	11	1-6	VI/16;VII/20	1-6	Private
BD	16N	38E	26	All	640.00	Strongly rolling grassland range	171	1-6	VII/640	1-6	Public
BD	16N	38E	28	SE¼;NE¼NE¼;N½NW¼;SW¼NW¼	320.00	Gentle to strongly rolling grassland range	91	1-6	VI/238;VII/82	1-6	Public
BD	16N	38E	34	All	640.00	Strongly rolling grassland range	169	1-6	VII/640	1-6	Public
BD	16N	39E	22	NW¼;N½SW¼;SW¼NE¼;NW¼SE¼	320.00	Strongly rolling grassland range	76	1-6	VII/320	1-6	Private
BD	16N	40E	2	SW¼SE¼	40.00	Mod. rolling grassland range	11	1-6	VII/40	1-6	Private
BD	16N	40E	4	NW¼SW¼	40.00	Mod. rolling grassland	11	1-6	VII/40	1-6	Private
BD	16N	40E	5	Sw¼SE¼	40.00	Strongly rolling grassland	11	1-6	VII/40	1-6	Private
BD	16N	40E	6	Lot 2	28.62	Mod. rolling thin breaks grassland	5	1-6	VII/29	1-6-9	Public
BD	16N	40E	32	E½NE¼	80.00	Mod. rolling grassland range	31	1-6	VI/80	1-2-6	Public
BD	16N	41E	6	Lots 1-3	90.68	Mod. rolling grassland range	22	1-6	VII/91	1-6	Public
BD	16N	42E	2	Lots 3-5,12	143.86	Mod. rolling grassland range	50	1-6	VI/144	1-6	Private
BD	16N	42E	4	Lots 1,2,8,9	142.61	Mod. rolling grassland range	51	1-6	VI/143	1-2-6	Private
BD	16N	42E	6	Lots 10-12;SE¼	277.26	Mod. rolling grassland range	99	1-6	VI/277	1-6	Private
BD	16N	43E	6	Lots 12,13;NE¼SE¼	107.82	Mod. rolling grassland range	38	1-6	VI/108	1-6	Private
BD	16N	43E	12	NE¼SE¼	40.00	Mod. rolling grassland range	13	1-6	VI/40	1-6	Private
BD	16N	44E	6	Lots 6,7,10	120.00	Mod. rolling grassland range	32	1-6	VI/120	1-6	Private
BD	16N	44E	8	NE¼NE¼	40.00	Gently rolling grassland range	14	1-6	VI/40	1-2-6	Private

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BD	16N	36E	6	Lots 3,7	71.90	Strongly rolling grassland	19	1-6	VII/72	1-6	Private
BD	16N	36E	8	NW¼SW¼	40.00	Gently rolling grassland	11	1-6	VI/40	1-6	Private
BD	16N	36E	14	N½	320.00	Steep badlands	32	1-6	VII/320	1-6	Private
BD	16N	36E	30	Lots 1,2;NE¼;E½NW¼	314.90	Strongly rolling to steep grassland range	79	1-4-6	VII/315	1-4-6	Private
BD	16N	37E	3	Lot 4	28.05	Gently rolling grassland	8	1-6	VII/28	1-6	Private
BD	16N	37E	4	Lots 1-4,7,8,10;NW¼SE¼; SW¼SW¼	312.64	Gently to mod. rolling grassland	82	1-6	VII/293;VIII/20	1-6	Private
BD	16N	37E	5	Lots 1-5,12;SW¼	353.60	Gently to mod. rolling grassland	96	1-6	VII/339;VIII/15	1-6	Private
BD	16N	37E	6	Lots 1,2,8,9;NE¼SE¼	177.45	Gently to mod. rolling grassland	50	1-6	VII/177	1-6	Private
BD	16N	37E	7	Lot 4;SE¼NW¼;SE¼NE¼	113.51	Gently to mod. rolling grassland	29	1-6	VII/114	1-6	Private
BD	16N	37E	8	S½SE¼;SE¼SW¼;SW¼NW¼	160.00	Gently to mod. rolling grassland	44	1-6	VII/160	1-6	Private
BD	16N	37E	20	NW¼;NW¼NE¼;N½SW¼	280.00	Gently to strongly rolling grassland	79	1-6	VI/15;VII/265	1-6	Private
BD	16N	37E	22	W½	320.00	Steep grassland range	84	1-6	VII/320	1-6	Private
~~BD~~	~~16N~~	~~37E~~	~~26~~	~~All~~	~~640.00~~	~~Steep grassland range~~	~~168~~	~~1-6~~	~~VII/640~~	~~1-6~~	~~Private~~
BD	16N	37E	30	Lots 1,4;E½NW¼	148.68	Gently to strongly rolling grassland	44	1-6	VI/35;VII/114	1-6	Private
BD	16N	37E	32	W½NW¼;S½SW¼	160.00	Nearly level to mod. rolling grasslands	36	1-6	VI/25;VII/135	1-6	Public
BD	16N	37E	34	E½NE¼	80.00	Gently rolling to steep grassland range	25	1-6	VI/55;VII/25	1-6	Private
BD	16N	38E	1	Lots 2,3	47.24	Nearly level grassland	13	1-6	VI/47	1-6	Private
BD	16N	38E	2	Lots 1-4,8,9	175.36	Gently to mod. rolling grassland range	47	1-6	VI/10;VII/165	1-6	Private
BD	16N	38E	3	Lots 1-4	97.04	Mod. rolling grassland	26	1-6	VII/97	1-6	Private
BD	16N	38E	4	Lots 1-4	98.68	Mod. to strong rolling grassland range	28	1-6	VII/99	1-6	Private

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BD	17N	33E	13	NW¼NE¼;E½SW¼	120.00	Mod. rolling grassland range	34	1-6	VI/40;VII/80	1-6	Private
BD	17N	33E	14	NW¼SW¼	40.00	Mod. to strongly rolling grassland range	11	1-6	VI/25;VII/15	1-6	Private
BD	17N	33E	15	NE¼SE¼	40.00	Strongly rolling grassland range	12	1-6	VII/40	1-6	Private
BD	17N	33E	21	SE¼,S½NE¼	240.00	Strongly sloping grassland range	69	1-6	VII/240	1-6	Private
BD	17N	33E	22	W½W½;NE¼NE¼	200.00	Strongly sloping grassland range	57	1-6	VII/200	1-6	Private
BD	17N	33E	24	W½NE¼	80.00	Nearly level to moderate rolling grassland	24	1-6	VI/33;VII/47	1-6	Private
BD	17N	33E	27	NW¼NW¼	40.00	Strongly sloping grassland range	11	1-6	VII/40	1-6	Private
BD	17N	33E	28	NE¼NE¼	40.00	Strongly sloping grassland range	11	1-6	VII/40	1-6	Private
BD	17N	34E	5	SE¼NW¼	40.00	Mod. rolling grassland range	10	1-6	VII/40	1-6	Private
BD	17N	34E	13	SE¼NW¼	40.00	Strongly rolling grass-sage rangeland	11	1-6	VII/40	1-6	Private
BD	17N	34E	17	NW¼NW¼	40.00	Mod. rolling grassland range	10	1-6	VII/40	1-6	Private
BD	17N	34E	22	NE¼NW¼	40.00	Mod. rolling grassland range	13	1-6	VI/40	1-6	Private
BD	17N	34E	25	NE¼;S½NW¼	240.00	Mod. rolling grassland range	69	1-6	VII/240	1-6	Private
BD	17N	34E	27	SW¼SW¼	40.00	Mod. rolling grassland range	9	1-6	VII/40	1-6	Private
BD	17N	34E	28	SE¼SE¼	40.00	Mod. rolling grassland range	9	1-6	VII/40	1-6	Private
BD	17N	34E	34	SW¼NW¼;NW¼SW¼	80.00	Gently rolling grassland range	14	1-6	VII/80	1-6	Private
BD	17N	35E	4	S½SW¼	80.00	Mod. rolling grassland range	21	1-6	VII/80	1-6	Private
BD	17N	35E	11	NE¼SW¼	40.00	Mod. rolling grassland range	9	1-6	VII/40	1-6	Private
BD	17N	35E	15	NE¼NW¼	40.00	Mod. rolling grassland range	11	1-6	VII/40	1-6	Private
BD	17N	35E	20	SW¼SE¼	40.00	Mod. rolling grassland range	11	1-5-6	VII/40	1-5-6	Private

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Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Present Land Use	Land Capability Classification	Principal Suitability	Proposed Management
BD	17N	35E	25	SW¼SE¼	40.00	Mod. rolling grassland range	11	1-6	VII/40	1-6	Private
BD	17N	35E	28	N½SW¼;SW¼SW¼;NW¼SE¼	160.00	Mod. rolling grassland range	33	1-6	VII/160	1-6	Public
BD	17N	35E	29	SE¼SW¼	40.00	Gently to mod. rolling grassland range	9	1-5-6	VI/13;VII/27	1-5-6	Public
BD	17N	35E	32	S½NE¼	80.00	Mod. rolling grassland range	17	1-6	VII/80	1-6	Public
BD	17N	35E	33	W½W½;SE¼SW¼;S½SE¼	280.00	Nearly level to moderately rolling grassland	60	1-6	VI/15;VII/265	1-6	Public
BD	17N	35E	34	E½NE¼;S½SW¼;SW¼SE¼	200.00	Nearly level to moderately rolling grassland	53	1-6	VI/20;VII/180	1-6	Public
BD	17N	35E	35	SW¼NW¼	40.00	Mod. rolling grassland range	11	1-5-6	VII/40	1-5-6	Public
BD	17N	36E	1	Lots 1-4;S½NE¼;N½SE¼;SE¼SE¼;S½SW¼	442.88	Mod. to strongly rolling grassland range	148	1-6	VI/413;VII/30	1-6	Public
BD	17N	36E	2	SW¼;E½SE¼	240.00	Mod. to strongly rolling grassland range	69	1-6	VI/128;VII/112	1-6	Public
BD	17N	36E	6	Lots 6,7,E½SW¼	157.49	Gently to strongly rolling grassland range	39	1-6	VI/20;VII/137	1-6	Private
BD	17N	36E	7	Lots 1,2;E½NW¼;W½NE¼;NE¼NE¼;SE¼SE¼	317.65	Gently to strongly rolling grassland range	67	1-6	VI/55;VII/263	1-6	Private
BD	17N	36E	11	NW¼NW¼;NE¼NE¼	80.00	Mod. to strong rolling grassland range	20	1-6	VI/10;VII/70	1-6-9	Public
BD	17N	36E	12	S½NE¼;N½NW¼;SE¼NW¼	200.00	Mod. to strongly rolling grassland range	49	1-6	VI/25;VII/175	1-6	Public
~~BD~~	~~17N~~	~~36E~~	~~16~~	~~NW¼~~	~~160.00~~	~~Nearly level to gently rolling grassland range~~	~~37~~	~~1-6~~	~~VI/75;VII/85~~	~~1-3-5-6~~	~~Public~~
BD	17N	36E	17	SE¼SW¼	40.00	Gently rolling grassland range	10	1-6	VII/40	1-6-9	Public
BD	17N	36E	19	SE¼SW¼	40.00	Mod. rolling grassland range	11	1-6	VI/34;VII/6	1-6	Private
BD	17N	36E	21	SE¼SW¼	40.00	Gently rolling grassland range	11	1-6	VI/40	1-6-9	Private
BD	17N	36E	23	SW¼NW¼	40.00	Mod. rolling grassland range	11	1-6	VI/18;VII/22	1-6	Private
BD	17N	36E	26	SW¼NW¼	40.00	Mod. rolling grassland range	10	1-6	VII/40	1-6	Private
BD	17N	36E	27	NW¼NW¼;E½SW¼	120.00	Gentle to mod. rolling grassland range	31	1-6	VI/40;VII/80	1-6	Private

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Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Present Land Use	Land Capability Classification	Principal Suitability	Proposed Management
BD	17N	35E	28	SE¼NE¼	40.00	Gently rolling grassland range	12	1-6	VI/40	1-6	Private
BD	17N	36E	29	SE¼SW¼	40.00	Mod. rolling grassland range	11	1-6	VI/40	1-6	Private
BD	17N	36E	30	SE¼SE¼; SW¼NE¼	80.00	Gentle to mod. rolling grassland range	22	1-6	VI/44;VII/36	1-6	Private
BD	17N	36E	35	SE¼SW¼	40.00	Gently rolling grassland range	11	1-6	VII/40	1-6	Private
~~BD~~	~~17N~~	~~36E~~	~~36~~	~~All~~	~~640.00~~	~~Mod. to strong rolling grassland range~~	~~181~~	~~1-6~~	~~VII/640~~	~~1-6~~	~~Private~~
BD	17N	37E	2	Lots 2,3	81.28	Mod. to strong rolling grassland range	18	1-6	VII/81	1-6	Private
BD	17N	37E	6	Lots 5,6,7	157.28	Mod. to strong rolling grassland range	46	1-6	VI/123;VII/34	1-6-9	Public
BD	17N	37E	8	SW¼NW¼	40.00	Strong rolling grassland range	11	1-6	VII/40	1-6	Private
BD	17N	37E	9	E½	320.00	Gentle to strongly rolling grassland range	105	1-6	VI/35;VII/285	1-6	Private
BD	17N	37E	12	NE¼;NE¼NW¼;N½SE¼	280.00	Strong rolling grassland range	76	1-6	VII/280	1-6	Private
BD	17N	37E	13	NW¼NW¼; SW¼SE¼	80.00	Gentle to mod. rolling grassland	21	1-6	VI/35;VII/45	1-6	Private
BD	17N	37E	15	SW¼SW¼	40.00	Strongly rolling grassland range	10	1-6	VII/40	1-6	Private
BD	17N	37E	17	NW¼NW¼	40.00	Mod. to strongly rolling grassland range	10	1-6	VII/40	1-6	Private
BD	17N	37E	18	NE¼NE¼	40.00	Mod. to strongly rolling grassland range	11	1-6	VII/40	1-6	Private
BD	17N	37E	19	SE¼; S½NE¼	240.00	Gently to strongly rolling grassland range	63	1-6	VII/240	1-6	Private
BD	17N	37E	20	S½	320.00	Strong rolling grassland range	80	1-6	VII/320	1-6	Private
BD	17N	37E	21	S½;E½NE¼	400.00	Gentle to strong rolling grassland range	111	1-6	VI/50;VII/350	1-6	Private
BD	17N	37E	22	W½NW¼;NW¼SW¼	120.00	Strong rolling grassland range	30	1-6	VII/120	1-6	Private
BD	17N	37E	23	SE¼; S½NE¼	240.00	Gentle to strong rolling grassland	59	1-6	VI/35;VII/205	1-2-6	Public
BD	17N	37E	24	SW¼; S½NW¼	240.00	Strong rolling grassland range	60	1-6	VII/240	1-2-6	Public

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Subbasin	Twp	range	Sec	Subdivision	Acres	General Land Character	AUMs	Present Land Use	Land Capability Classification	Principal Suitability	Proposed Management
BD	17N	37E	25	SW¼;W½NW¼;E½SE¼	320.00	Strongly rolling grassland range	80	1-6	VII/320	1-2-6	Public
BD	17N	37E	26	All	640.00	Gentle to strongly rolling grassland	160	1-6	VI/20;VII/620	1-2-6	Public
BD	17N	37E	28	NW¼;E½E½;SE¼SW¼	360.00	Strongly rolling grassland range	90	1-6	VII/360	1-6	Private
BD	17N	37E	29	N½N½;SE¼NE¼	200.00	Gentle to strongly rolling grassland range	51	1-6	VII/200	1-6	Private
BD	17N	37E	30	E½NE¼	80.00	Gently rolling grassland range	22	1-6	VII/80	1-6	Private
BD	17N	37E	32	S½SE¼;SE¼SW¼	120.00	Gently rolling grassland range	32	1-6	VII/110;VIII/10	1-6	Private
BD	17N	37E	33	SW¼SW¼;NE¼NW¼	80.00	Strongly rolling grassland range	18	1-6	VII/80	1-6	Private
BD	17N	37E	35	S½	320.00	Strongly rolling grassland range	80	1-6	VII/320	1-2-6	Public
~~BD~~	~~17N~~	~~38E~~	~~4~~	~~SW¼SW¼~~	~~40.00~~	~~Mod. to strongly rolling grassland range~~	~~11~~	~~1-6~~	~~VII/40~~	~~1-6~~	~~Private~~
BD	17N	38E	5	SW¼SW¼; SW¼SE¼	80.00	Strongly rolling grassland range	22	1-6	VII/80	1-6	Private
BD	17N	38E	6	E½SW¼	80.00	Strongly rolling grassland range	22	1-6	VII/80	1-6	Private
BD	17N	38E	7	NE¼	160.00	Strongly rolling grassland range	44	1-6	VII/160	1-6	Private
~~BD~~	~~17N~~	~~38E~~	~~9~~	~~NE¼NE¼~~	~~40.00~~	~~Mod. to strong rolling grassland range~~	~~12~~	~~1-6~~	~~VII/40~~	~~1-6~~	~~Private~~
BD	17N	38E	13	E½SE¼;NW¼SW¼	120.00	mod. rolling grassland range	10	1-6	VI/35;VII/85	1-6-9	Public
BD	17N	38E	18	Lot 1;NE¼SW¼	79.61	Gentle to mod. rolling grassland range	21	1-6	VI/35;VII/45	1-6	Private
BD	17N	38E	24	S½NW¼	80.00	Mod. to strong rolling grassland range	17	1-6	VII/80	1-6-9	Public
BD	17N	38E	31	Lots 1-4;SE¼SW¼;S½SE¼; NE¼SE¼	319.76	Strong rolling grassland range	94	1-6	VII/320	1-6	Private
BD	17N	41E	3	Lot 3	40.29	Mod. rolling grassland	12	1-4	VII/40	1-4	Private
BD	17N	41E	4	Lot 2	40.47	Gently rolling grassland	12	1-4	VII/40	1-4	Private
BD	17N	41E	12	All	640.00	Mod. to strongly rolling grassland	205	1-4	VI/530;VII/110	1-4	Public

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Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Present Land Use	Land Capability Classification	Principal Suitability	Proposed Management
BD	17N	41E	15	NW¼	160.00	Moderately rolling grassland	41	1-4	VII/160	1-4	Public
BD	17N	42E	10	SW¼	160.00	Mod. to strongly rolling grassland	47	1-4	VI/40;VII/120	1-4	Public
BD	17N	42E	14	SE¼SE¼;NE¼;N½NW¼;SW¼NW¼	320.00	Mod. to strongly rolling grassland	98	1-4	VI/170;VII/150	1-4	Public
BD	17N	42E	32	NE¼SE¼	40.00	Moderately rolling grassland	14	1-4	VI/40	1-4	Private
BD	17N	42E	34	SE¼SW¼	40.00	Gently rolling grassland	14	1-4	VI/40	1-4	Private
BD	17N	43E	14	N½N½;SW¼NE¼;SW¼NW¼;SW¼SW¼;SW¼SE¼	320.00	Gently to strongly rolling grassland	62	1-4	VII/320	1-4	Private
BD	17N	43E	18	N½SE¼;SE¼NE¼	120.00	Gently to strongly rolling grassland	42	1-4	VI/102;VII/18	1-4	Public
BD	18N	33E	13	W½NW¼	80.00	Mod. rolling grassland range	21	1-6	VII/80	1-6	Private
BD	18N	34E	4	SE¼SE¼	40.00	Mod. rolling grassland range	11	1-6	VII/40	1-6-9	Public
BD	18N	34E	9	E½NE¼;SW¼NE¼;NE¼SE¼	160.00	Mod. rolling grassland range	46	1-6	VII/160	1-6-9	Public
BD	18N	34E	10	N½SW¼;SE¼SW¼	120.00	Mod. rolling grassland range	34	1-6	VII/120	1-6-9	Public
BD	18N	34E	14	E½NE¼;NE¼SW¼	120.00	Mod. rolling grassland range	34	1-6	VII/120	1-6-9	Public
BD	18N	34E	20	E½SE¼	80.00	Mod. rolling grassland range	24	1-6	VII/80	1-6	Private
BD	18N	34E	30	Lot 3	25.29	Gently sloping grass-sage range	8	1-6	VI/25	1-6	Private
BD	18N	34E	32	NW¼SW¼	40.00	Gently rolling grassland range	15	1-6	VI/40	1-6-9	Public
BD	18N	35E	1	Lots 1,2;SE¼NE¼;NE¼SE¼	160.07	Mod. to strongly rolling grassland range	33	1-6	VII/160	1-6	Private
BD	18N	36E	5	NE¼SW¼	40.00	Gently rolling grassland range	11	1-6	VII/40	1-6	Private
BD	18N	36E	12	N½SW¼	80.00	Steeply rolling grassland range	12	1-6	VII/80	1-3-6-9	Public
BD	18N	36E	14	SW¼NW¼	40.00	Gently rolling grassland range	6	1-6	VII/40	1-6	Private
BD	18N	36E	15	SE¼NE¼	40.00	Gently rolling grassland range	6	1-6	VII/40	1-6	Private

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Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Present Land Use	Capability Classification	Principal Suitability	Proposed Management
BD	18N	36E	17	SE¼NE¼	40.00	Gently rolling grassland range	6	1-6	VII/40	1-6	Private
BD	18N	36E	29	SE¼NW¼	40.00	Strongly rolling grassland range	6	1-6	VII/40	1-6	Private
BD	18N	37E	31	Lots 2,3;SE¼NW¼	116.42	Mod. rolling grassland range	31	1-6	VI/116	1-3-6	Public
BD	18N	37E	32	SE¼SW¼	40.00	Mod. rolling grassland range	9	1-6	VI/40	1-6	Private
BD	18N	37E	35	SW¼;N½SE¼	240.00	Mod. to strongly rolling grassland range	29	1-6	VII/240	1-6	Private
BD	18N	38E	3	Lot 2,3;SE¼NW¼	120.18	Mod. to strongly rolling grassland	20	1-6	VII/120	1-6	Private
BD	18N	38E	5	Lot 4	40.32	Mod. rolling grassland range	10	1-6	VII/40	1-6	Private
BD	18N	38E	6	SW¼NE¼;N½SE¼	120.00	Mod. rolling grassland range	27	1-6	VII/120	1-6	Private
BD	18N	38E	9	NE¼NE¼	40.00	Strongly rolling grassland range	6	1-6	VII/40	1-6	Private
BD	18N	38E	24	S½	320.00	Gentle to strongly rolling grassland range	60	1-6	VII/320	1-6-9	Public
BD	18N	38E	29	NE¼NE¼	40.00	Strongly rolling grassland range	6	1-6	VII/40	1-6-9	Public
BD	18N	38E	31	Lots 3,4;E½SW¼	156.98	Mod. rolling grassland range	42	1-6	VII/157	1-6	Private
BD	18N	38E	33	NE¼NE¼	40.00	Mod. rolling grassland range	10	1-6	VII/40	1-6-9	Public
BD	18N	39E	14	SW¼SW¼	40.00	Strongly rolling grassland range	6	1-6	VII/40	1-6-9	Public
BD	18N	39E	15	NW¼SW¼	40.00	Mod. rolling grassland range	11	1-6	VII/40	1-6-9	Public
BD	18N	39E	23	SW¼NW¼;NW¼SW¼	80.00	Strongly rolling grassland range	11	1-6	VII/80	1-6-9	Public
BD	18N	39E	26	NW¼SW¼	40.00	Gently rolling grassland range	11	1-6	VII/40	1-6-9	Public
BD	18N	39E	27	N½SE¼	80.00	Gently rolling grassland range	22	1-6	VII/80	1-6-9	Public
BD	18N	39E	30	Lot 1	37.84	Gently rolling grassland range	10	1-6	VII/38	1-6-9	Public
BD	18N	39E	31	NE¼NW¼	40.00	Gently rolling grassland range	11	1-6	VII/40	1-6-9	Public

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Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Present Land Use	Land Capability Classification	Principal Suitability	Proposed Management
BD	18N	39E	34	SE¼SE¼	40.00	Strongly rolling grassland range	6	1-6	VII/40	1-6-9	Public
BD	18N	39E	35	SW¼SW¼	40.00	Strongly rolling grassland range	7	1-6	VII/40	1-6-9	Public
BD	18N	40E	18	Lot 4;SE¼SW¼	77.84	Strongly rolling grassland range	13	1-6	VII/78	1-6-9	Public
BD	19N	34E	17	W½SW¼	80.00	Steeply sloping grassland range	14	1-6	VII/80	1-6-9	Private
BD	19N	34E	18	Lot 4;SE¼SW¼;W½SE¼;SE¼SE¼	185.05	Nearly level to steeply sloping grassland range	41	1-6	VI/50;VII/135	1-2-6	Private
BD	19N	34E	30	Lot 4	25.57	Moderately rolling grassland range	8	1-6	VII/26	1-6	Private
BD	19N	35E	2	SW¼SW¼	40.00	Gently rolling grassland range	9	1-6	VI/40	1-6-9	Public
BD	19N	35E	3	E½SE¼	80.00	Gently rolling grassland range	18	1-6	VI/80	1-6-9	Public
BD	19N	35E	32	SE¼	160.00	Mod. to strongly rolling grassland range	33	1-6	VII/160	1-6	Private
BD	19N	35E	33	S½SW¼	80.00	Mod. to strongly rolling grassland range	16	1-6	VII/80	1-6	Private
BD	19N	36E	2	NE¼SE¼	40.00	Gently rolling grassland range	9	1-6	VII/30;VIII/10	1-3-6	Public
BD	19N	36E	12	NE¼	160.00	Gently rolling grassland range	43	1-6	VII/160	1-6	Private
BD	19N	36E	33	E½NE¼	80.00	Mod. to strongly rolling grass - sage range	13	1-6	VII/80	1-6	Private
BD	19N	36E	35	SE¼NE¼;NE¼SE¼	80.00	Gently rolling grassland range	20	1-6	VII/80	1-6	Private
BD	19N	37E	7	Lot 1;N½NE¼;NE¼NW¼	154.17	Gently to strongly rolling grassland range	28	1-6	VII/154	1-6	Private
BD	19N	37E	9	SW¼NE¼	40.00	Mod. rolling grassland range	8	1-6	VII/40	1-6	Private
BD	19N	37E	10	S½NW¼	80.00	Mod. rolling grassland range	16	1-6	VII/80	1-6	Private
BD	19N	37E	15	SW¼NW¼	40.00	Mod. to strongly rolling grassland range	12	1-6	VI/20;VII/20	1-6	Private
BD	19N	37E	24	NW¼NW¼	40.00	Strongly rolling grassland range	6	1-6	VII/40	1-6	Private
BD	19N	37E	25	SW¼NE¼	40.00	Gently to steeply rolling grassland range	6	1-6	VII/40	1-6	Private

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Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Present Land Use	Land Capability Classification	Principal Suitability	Proposed Management
BD	19N	37E	29	SE¼SW¼	40.00	Gently rolling grassland range	15	1-6	VI/40	1-6	Private
BD	19N	37E	35	W½NW¼	80.00	Strongly rolling grassland range	10	1-6	VII/80	1-6	Private
BD	19N	38E	8	E½NW¼	80.00	Mod. to strongly rolling grass - sage range	16	1-6	VI/18;VII/62	1-6	Private
BD	19N	38E	9	SE¼NE¼;NE¼NW¼;SE¼	240.00	Mod. to strongly rolling grass - sage range	52	1-6	VI/20;VII/220	1-6	Private
BD	19N	38E	13	NE¼NE¼;SW¼SE¼;E½SE¼	160.00	Mod. to strongly rolling grassland range	31	1-6	VII/160	1-6	Private
BD	19N	38E	14	NE¼;N½SE¼;SW¼SE¼	280.00	Mod. to strongly rolling grassland range	55	1-6	VII/280	1-6	Private
BD	19N	38E	23	NW¼NE¼	40.00	Strongly rolling grassland range	7	1-6	VII/40	1-6	Private
BD	19N	38E	32	NW¼NE¼;SW¼SW¼	80.00	Mod. to strongly rolling grassland range	14	1-6	VII/75;VIII/5	1-6	Private
BD	19N	38E	33	SW¼NW¼	40.00	Gently to mod. rolling public domain	11	1-6	VI/10;VII/30	1-6	Private
BD	19N	39E	4	SW¼SE¼	40.00	Mod. rolling grassland range	9	1-6	VII/40	1-5-6	Private
BD	19N	39E	5	SW¼SW¼	40.00	Mod. rolling grassland range	7	1-6	VII/40	1-6	Private
BD	19N	39E	7	NE¼NW¼;E½SE¼	120.00	Nearly level to gently rolling grassland range	29	1-6	VI/110;VII/10	1-6	Private
BD	19N	39E	8	SW¼SW¼	40.00	Nearly level to mod. rolling grassland	5	1-6	VI/10;VII/30	1-6	Private
BD	19N	39E	17	SW¼SE¼	40.00	Gently rolling grassland range	6	1-6	VII/40	1-6	Private
BD	19N	39E	18	E½SW¼	80.00	Gently to mod. rolling grassland range	18	1-6	VII/80	1-6	Private
BD	19N	39E	22	SW¼NW¼	40.00	Mod. rolling grassland range	7	1-6	VII/40	1-6	Private
BD	20N	32E	2	NE¼SW¼	40.00	Strongly rolling conifer	10	1-4	VII/40	1-4-8	Public
BD	20N	32E	10	NW¼SE¼	40.00	Moderately rolling grassland	14	1-4	VI/40	1-4	Private
~~BD~~	~~20N~~	~~32E~~	~~12~~	~~NW¼;N½SW¼;SW¼SW¼~~	~~280.00~~	~~Mod. to strongly rolling grassland and conifer~~	~~66~~	~~1-4-6~~	~~VI/205;VII/75~~	~~1-3-4-6-7~~	~~Public~~
BD	20N	33E	9	NW¼SW¼	40.00	Moderately rolling grassland	14	1-4	VI/40	1-4	Public

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Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Present Land Use	Land Capability Classification	Principal Suitability	Pr posed Management
BD	20N	33E	15	S½SW¼	80.00	Steeply rolling grassland	18	1-4	VII/80	1-4	Private
BD	20N	33E	21	NE¼;E½NW¼;NE¼SW¼;N½SE¼	360.00	Mod. rolling grassland and conifer	81	1-4-6	VI/290;VII/70	1-3-4-6	Public
BD	20N	34E	1	Lots 2,3;SW¼NE¼;SE¼NW¼; SE¼SW¼	220.56	Mod. to steeply rolling grassland and conifer	54	1-4	VI/119;VII/102	1-4-6	Private
BD	20N	34E	25	NW¼NE¼	40.00	Gently to mod. rolling grassland	15	1-4	VI/40	1-4	Private
BD	20N	34E	35	SW¼NW¼	40.00	Gently to steeply rolling grassland	8	1-4	VI/17;VII/23	1-4	Public
~~BD~~	~~20N~~	~~34E~~	~~36~~	~~All~~	~~640.00~~	~~Mod. to strongly rolling grassland and sagebrush~~	~~173~~	~~1-4~~	~~VI/435;VII/205~~	~~1-4-9~~	~~Public~~
BD	20N	35E	11	W½W½;SE¼	320.00	Mod. to steeply rolling grassland	81	1-4	VII/320	1-4	Public
BD	20N	35E	32	W½NW¼;NW¼SW¼	120.00	Gently to mod. rolling grassland	39	1-4	VI/120	1-4	Private
BD	20N	36E	3	SW¼NW¼	40.00	Gently to mod. rolling grassland	14	1-4	V/25;VI/15	1-4	Public
BD	20N	36E	4	SW¼SE¼	40.00	Strongly rolling grassland	7	1-4	VII/40	1-4	Public
BD	20N	36E	19	NE¼SW¼;NW¼SE¼	80.00	Mod. to strongly rolling grassland and sagebrush	15	1-4	VII/80	1-4	Public
BD	20N	36E	35	NE¼NW¼	40.00	Mod. rolling grassland	6	1-4	VII/40	1-4	Private
BD	20N	38E	18	S½SE¼;NE¼SE¼	120.00	Strongly rolling	32	1	VII/120	1-4	Public
BD	20N	38E	20	SE¼SW¼	40.00	Mod. rolling	11	1	VII/40	1	Public
BD	20N	38E	22	NE¼NE¼;NE¼NW¼;NW¼SE¼	120.00	Mod. to strongly rolling	51	1	VII/120	1	Public
BD	20N	38E	25	E½SW¼;SW¼SE¼	120.00	Strongly rolling	20	1	VII/120	1	Public
BD	20N	38E	35	SW¼NW¼;SW¼;NW¼SE¼	240.00	Gentle to strongly rolling	61	1	V/85;VI/20; VII/135	1	Public
BD	20N	39E	27	SW¼NE¼;NW¼SE¼	80.00	Mod. to steeply rolling grassland and waste	16	1-4	VII/55;VIII/25	1-4	Public
BD	20N	39E	28	SW¼NW¼	40.00	Mod. rolling sagebrush	15	1-4	VI/40	1-4	Public
BD	20N	39E	30	Lots 3,4;SE¼SW¼	112.27	Gently to strongly rolling sagebrush	28	1-4	VII/112	1-4	Public

Garfield County

Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Present Land Use	Land Capability Classification	Principal Suitability	Proposed Management
BD	20N	39E	31	Lots 1,2;E½NW¼	152.47	Gently to strongly rolling grassland	27	1-4	VII/152	1-4	Public
BD	20N	39E	32	E½SW¼	80.00	Mod. rolling grassland	22	1-4	VII/80	1-4	Public
BD	20N	39E	35	NE¼SE¼	40.00	Strongly rolling sage-sagebrush	9	1-4	VII/40	1-4	Public
BD	21N	33E	28	NE¼NW¼	40.00	Mod. rolling grassland	11	1-4	IV/4;VI/36	1-4	Private
BD	21N	34E	34	NW¼SE¼	40.00	Strongly rolling grassland	9	1-4	VII/40	1-4	Private
BD	21N	35E	33	SE¼NW¼;NW¼SE¼	80.00	Mod. rolling grassland	15	1-4	VII/80	1-4	Public
BD	21N	36E	19	SW¼NE¼	40.00	Mod. to strongly rolling grassland	8	1-4	VII/40	1-4	Public
BD	21N	36E	20	SE¼SW¼	40.00	Mod. to strongly rolling grassland	10	1-4	VII/40	1-4	Public
BD	21N	36E	29	SW¼NW¼; SW¼SE¼	80.00	Mod. to strongly rolling grassland	19	1-4	VII/80	1-4	Public
BD	21N	36E	30	SE¼NE¼; SE¼NW¼	80.00	Strongly rolling grassland	14	1-4	VII/80	1-4	Public
McCone County											
~~MP~~	~~16N~~	~~46E~~	~~2~~	~~SW¼NW¼~~	~~40.00~~	~~Gently to mod. rolling grassland~~	~~12~~	~~1-6-9~~	~~V/40~~	~~1-2~~	~~Private~~
~~MP~~	~~17N~~	~~49E~~	~~2~~	~~All~~	~~640.00~~	~~Gentle to steep rolling grass - shrub range~~	~~72~~	~~1-6-9~~	~~VI/250;VII/391~~	~~1~~	~~Private~~
~~MP~~	~~17N~~	~~49E~~	~~12~~	~~N½N½;SW¼NW¼;W½SW¼~~	~~280.00~~	~~Gentle to steep rolling grass - shrub range~~	~~36~~	~~1-6-9~~	~~V/50;VII/230~~	~~1~~	~~Private~~
MP	17N	49E	28	SW¼NW¼	40.00	Gently rolling grassland range	11	1-6-9	VI/40	1	Private
BD	18N	45E	28	E½NW¼	80.00	Strongly rolling grassland	14	1-4	VII/80	1-4	Private
MP	18N	49E	20	SW¼SW¼	40.00	Mod. rolling grassland range	10	1-6-9	VI/40	1	Private
BD	19N	44E	2	Lots 1-4;S½N½	321.00	Mod. rolling grassland	97	1-4	VII/321	1-4	Private
BD	19N	44E	10	S½	320.00	Mod. rolling grassland	90	1-4	VII/320	1-4	Public
BD	19N	44E	26	S½	320.00	Mod. rolling grassland	89	1-4	VI/320	1-4	Private

McCone County

Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Present Land Use	Land Capability Classification	Principal Suitability	Proposed Management
BD	19N	45E	10	SW¼SE¼;SE¼SW¼	80.00	Moderately rolling grassland	22	1-4	VII/80	1-4	Private
BD	19N	45E	24	NE¼	160.00	Strongly rolling grassland	47	1-4	VII/160	1-4-8-9	Public
MP	19N	46E	6	Lot 1	38.54	Strong rolling grassland	7	1-6-9	VII/39	1	Private
BD	20N	44E	22	S½NW¼;E½SE¼	160.00	Steeply rolling grassland	24	1-4	VII/160	1-4	Public
BD	20N	45E	4	Lot 1	49.60	Gently rolling grassland	13	1-4	VI/50	1-4	Public
BD	21N	45E	20	S½N½;NE¼NE¼;NW¼NW¼	240.00	Strongly rolling grassland	51	1	V/72;VII/168	1	Private
BD	21N	45E	30	S½	319.50	Strongly rolling grassland	60	1	VII/319	1	Public
BD	21N	45E	32	NW¼NW¼	40.00	Strongly rolling grassland	8	1	VII/40	1	Public
MP	21N	46E	30	Lots 1-4;NE¼NW¼;E½SW¼; SW¼SE¼	318.60	Moderately to strongly rolling	54	1	VII/319	1	Private
MP	22N	45E	1	Lot 2	39.63	Mod. to strongly rolling grassland range	6	1	VII/40	1	Public
~~MP~~	~~22N~~	~~46E~~	~~7~~	~~E½NE¼~~	~~80.00~~	~~Nearly level to moderate rolling grassland~~	~~26~~	~~1-2~~	~~IV/20;V/60~~	~~1-2~~	~~Private~~
MP	22N	46E	8	N½NE¼	80.00	Moderately rolling grassland	22	1-2	VI/80	1-2	Private
MP	22N	46E	24	SW¼SE¼	40.00	Strongly rolling grassland	10	1	VII/40	1-9	Public
MP	22N	47E	5	SW¼SE¼	40.00	Strongly rolling grassland	7	1	VII/40	1-9	Public
MP	22N	49E	20	SW¼SW¼	40.00	Moderate to strongly rolling grassland	8	1	VI/10;VII/30	1	Private
MP	22N	49E	26	All	640.00	Moderate to strongly rolling grassland	123	1	VII/640	1	Private
MP	23N	46E	1	NW¼SE¼	40.00	Moderately rolling grassland	7	1-4-6	VI/40	1-3-4-6	Private
MP	23N	46E	31	SW¼NE¼	40.00	Moderately rolling grassland	12	1-4-6	VI/40	1-2-3-4-6	Private
~~MP~~	~~23N~~	~~46E~~	~~32~~	~~SW¼;SE¼SE¼~~	~~200.00~~	~~Moderately rolling grassland~~	~~62~~	~~1-4-6~~	~~IV,V/120;VII/80~~	~~1-2-3-4-6~~	~~Private~~
MP	23N	47E	2	NE¼SW¼	40.00	Moderately rolling grassland	8	1-4-6	VI/40.00	1-2-3-4-6	Public

McCone County

Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Present Land Use	Land Capability Classification	Principal Suitability	Proposed Management
MP	23N	47E	4	Lot 1;NE¼SE¼	79.26	Moderately rolling grassland	17	1-4-6	VI/79	1-2-3-4-6	Private
MP	23N	47E	5	SW¼NE¼	40.00	Moderately rolling grassland	6	1-4-6	VI/40	1-2-3-4-6	Private
MP	23N	47E	10	NW¼NE¼	40.00	Moderate to strongly rolling grassland	6	1-4-6	VI/20;VII/20	1-3-4-6	Private
MP	24N	46E	7	NE¼NW¼	40.00	Nearly level bottom or plain	19	1-3-4-6	IV/35;VI/5	1-2-3-4-6	Public
MP	24N	46E	18	Lot 3;SE¼NW¼	74.79	Level to strongly rolling lowland	17	1	IV/20;VII/55	1-3-4	Public
MP	24N	46E	19	Lot 3	34.97	Gently rolling grassland range	9	1	VI/35	1-3-4-9	Public
MP	24N	46E	26	SE¼SE¼	40.00	Moderately rolling grassland	8	1-4-6	VI/40	1-2-3-4-5-6	Private
MP	24N	46E	35	NW¼SE¼	40.00	Moderately rolling grassland	11	1-4	VI/40	1-2-3-4-5-6	Private
~~MP~~	~~24N~~	~~47E~~	~~11~~	~~SE¼NE¼~~	~~40.00~~	~~Thin silty grassland~~	~~8~~	~~1~~	~~VI/40~~	~~1-3-9~~	~~Public~~
~~MP~~	~~24N~~	~~47E~~	~~12~~	~~SW¼SW¼~~	~~40.00~~	~~Subirrigated grassland~~	~~30~~	~~1~~	~~VI/40~~	~~1-3-9~~	~~Public~~
~~MP~~	~~24N~~	~~47E~~	~~14~~	~~NE¼SW¼~~	~~40.00~~	~~Gently rolling grassland~~	~~13~~	~~1-4~~	~~V/40~~	~~1-2-3-4~~	~~Private~~
MP	24N	47E	21	NE¼NE¼	40.00	Cultivated (5) to mod. rolling grassland	6	1-2-4	II/5;VI/35	1-2-3-4	Public
MP	24N	47E	31	SE¼SE¼	40.00	Moderately rolling grassland	11	1-2-4	VI/40	1-2-3-4	Private
MP	24N	47E	35	E½NW¼;SW¼NW¼;SW¼NE¼; NW¼SE¼	200.00	Gentle to strongly broken grassland	35	1-4	VI/130;VII/70	1-2-3-4	Private
MP	24N	48E	4	Lot 3	26.85	Thin clayey grassland	5	1	VI/27	1	Private
MP	24N	48E	5	Lot 2	27.30	Thin clayey grassland	5	1	VI/27	1	Private
MP	24N	48E	8	SE¼NE¼;NW¼SW¼	80.00	Gentle to moderately rolling grassland	19	1	VI/60;VII/20	1	Private
MP	24N	48E	9	SW¼NE¼;N½SW¼;SE¼SW¼	160.00	Gentle to moderately rolling grassland	34	1	VI/60;VII/100	1	Private
MP	24N	48E	10	SW¼NW¼	40.00	Strongly rolling grassland	9	1	VII/40	1	Private
MP	24N	48E	11	NW¼SW¼	40.00	Strongly rolling grassland	9	1	VII/40	1	Private

McCone County

Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Present Land Use	Land Capability Classification	Principal Suitability	Proposed Management
MP	24N	48E	17	S½NE¼;SW¼SW¼;SE¼	280.00	Strongly rolling grassland range	79	1	VI/280	1	Private
MP	24N	48E	19	NE¼NE¼;SE¼SE¼	80.00	Moderate to strongly rolling grassland	18	1	VI/80	1	Private
MP	24N	48E	20	NE¼NE¼	40.00	Strongly rolling grassland	11	1	VI/40	1	Private
MP	24N	48E	21	N½NW¼;SE¼NW¼	120.00	Strongly rolling grassland	35	1	VI/120	1	Private
~~MP~~	~~24N~~	~~50E~~	~~12~~	~~SE¼NE¼~~	~~40.00~~	~~Moderate to strongly rolling grassland~~	~~9~~	~~1~~	~~VI/30;VII/10~~	~~1~~	~~Private~~
~~MP~~	~~24N~~	~~50E~~	~~14~~	~~SW¼SE¼~~	~~40.00~~	~~Moderate to strongly rolling grassland~~	~~9~~	~~1-9~~	~~VI/10;VII/30~~	~~1-3-9~~	~~Public~~
MP	25N	45E	1	SW¼SE¼	40.00	Strong sloped browse-grassland	13	1	VII/40	1	Private
MP	25N	45E	2	Lots 3,4;SW¼NW¼	118.48	Nearly level to strong sloped grassland	34	1	VI/12;VII/106	1-3-4	Public
MP	25N	45E	11	SE¼	160.00	Moderately rolling grassland	41	1	VII/160	1	Private
MP	25N	45E	12	W½SW¼;SE¼NE¼	120.00	Moderate to strong rolling grassland	30	1	VII/120	1	Private
MP	25N	45E	14	NE¼NE¼	40.00	Moderately rolling grassland	9	1	VII/40	1	Private
MP	25N	45E	14	SW¼SW¼	40.00	Subirrigated stream bottom	33	1-3-4	V/40	1-3-4-9	Public
MP	25N	45E	24	NW¼NW¼;NE¼SW¼	80.00	Moderate rolling grassland	21	1	VII/80	1	Private
MP	25N	45E	28	W½SW¼	80.00	Moderate rolling grassland range	19	1	VII/80	1	Private
MP	25N	45E	33	N½NW¼	80.00	Moderate to steep grassland	17	1	VII/80	1	Private
MP	25N	46E	6	Lot 4	38.52	Thin breaks grassland	6	1	VII/39	1	Private
MP	25N	46E	20	SW¼NW¼	40.00	Steeply rolling grassland	11	1-2	IV/5;VI/15; VII/20	1-2	Private
MP	25N	47E	1	Lots 2,3,4	123.64	Steep sagebrush range	17	1	VII/124	1	Private
MP	25N	47E	3	NW¼SW¼	40.00	Gently rolling grassland	11	1-9	VI/40	1-3-9	Public
MP	25N	47E	4	NE¼SE¼	40.00	Gently rolling grassland	11	1-9	VII/40	1-3-9	Public
MP	25N	47E	4	NE¼SW¼	40.00	Gently rolling grassland	11	1	VII/40	1	Private

McCone County

Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Present Land Use	Land Capability Classification	Principal Suitability	Proposed Management
MP	25N	47E	5	SW¼NW¼;NE¼SE¼	80.00	Moderately rolling grassland	21	1	VII/80	1	Private
MP	25N	47E	6	SE¼NE¼	40.00	Moderately rolling grassland	11	1	VII/40	1	Private
MP	25N	48E	4	SE¼NE¼	40.00	Moderately rolling grassland	8	1	VII/40	1	Private
MP	25N	48E	10	NE¼SW¼;SW¼SW¼	80.00	Moderately rolling grassland	23	1	VII/80	1-3-9	Public
MP	25N	48E	19	Lot 4;SE¼SE¼	80.54	Mod. to steep rolling grassland range	20	1	VII/81	1	Private
MP	25N	48E	20	S½;SW¼NW¼	360.00	Mod. to steep rolling grassland	81	1	VII/360	1	Private
MP	25N	48E	29	NE¼	160.00	Mod. to steep rolling grassland	27	1	VII/160	1	Private
MP	25N	48E	32	NE¼NE¼	40.00	Moderate rolling grassland	10	1	VII/40	1	Private
MP	25N	50E	25	NW¼;NE¼SW¼;NE¼NE¼;S½NE¼	320.00	Nearly level to strong rolling grassland	86	1	V/75;VII/145	1-2	Private
MP	26N	45E	13	Lot 6	31.78	River overlook	8	1	VI/32	1-3-9	Public
MP	26N	45E	15	Lot 4; E½SW¼;SW¼SW¼	152.89	River overlook	31	1	VII/153	1-9	Public
MP	26N	45E	16	SE¼SE¼	40.00	River overlook	6	1	VII/40	1-9	Public
MP	26N	45E	26	NE¼NE¼;E½SE¼	120.00	Level to strong sloped meadow	32	1	VI/40;VII/80	1-3-4-9	Public
MP	26N	45E	32	SE¼SW¼	40.00	Strongly rolling grassland	10	1	VII/40	1	Private
MP	26N	45E	35	SE¼;E½NE¼	240.00	Mod. to strongly rolling grassland	57	1	VII/240	1-3-4-9	Public
MP	26N	46E	3	Lots 7,8,9	92.09	Nearly level river bottom	3	1	V/92	1-3-9	Public
MP	26N	46E	9	Lot 8	17.98	Cultivated	0	2	V/18	2	Private
MP	26N	46E	19	Lots 3,4,9,10	111.52	Strongly sloped grassland	18	1	VII/112	1	Private
MP	26N	46E	21	NE¼NW¼;SW¼NW¼;SE¼	240.00	Moderate to steep grassland	45	1	VII/35;VIII/205	1	Private
MP	26N	46E	22	N½NE¼;W½SW¼	160.00	Moderate to steep grassland	31	1	VII/43;VIII/117	1	Private

McCone County

Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Present Land Use	Land Capability Classification	Principal Suitability	Proposed Management
MP	26N	47E	3	SE¼SE¼	40.00	Strongly rolling grassland	8	1	VII/40	1	Private
MP	26N	47E	6	Lot 4	24.44	River bottomland	2	1	V/10;VII/14	1	Private
~~MP~~	~~26N~~	~~47E~~	~~7~~	~~Lot 1;E½NE¼~~	~~117.35~~	~~Mod. rolling grassland and cropland~~	~~7~~	~~1-2~~	~~IV/80;V/37~~	~~1-2~~	~~Private~~
MP	26N	47E	9	SE¼	160.00	Mod. to steep rolling grassland	24	1	VII/160	1	Private
MP	26N	47E	10	NW¼NE¼	40.00	Strongly rolling grassland	8	1	VII/40	1	Private
MP	26N	47E	11	NW¼NW¼;NW¼SW¼;S½SW¼	160.00	Strongly rolling to gentle grassland and saltbush	28	1	V/50;VII/50; VIII/60	1	Private
MP	26N	47E	14	NW¼	160.00	Nearly level to steep grassland-browse-shrub	15	1	VII/35;VIII/125	1	Private
MP	26N	47E	15	NE¼NE¼	40.00	Strong to steep grassland-browse-shrub	11	1	VII/35;VIII/5	1	Private
MP	26N	47E	19	SE¼NW¼	40.00	Strongly rolling grassland	10	1	VII/40	1	Private
MP	26N	47E	25	N½NE¼;SE¼NE¼;NE¼SE¼	160.00	Mod. to steep grassland-sage range	29	1	VI/10;VII/150	1	Public
MP	26N	47E	27	NW¼SW¼	40.00	Gentle to strongly rolling grassland	5	1-2	V/20;VII/20	1-2	Private
MP	26N	47E	29	SW¼SW¼	40.00	Strongly rolling grassland	7	1	VII/40	1	Private
MP	26N	47E	30	NE¼NE¼	40.00	Gentle to strongly rolling sage-grass	11	1-3-4	VI/40	1-3-4	Public
MP	26N	47E	30	Lot 2;E½NW¼;NW¼NE¼	157.96	Strongly rolling grassland	28	1-3-4	VII/158	1-3-4	Public
MP	26N	47E	31	E½SE¼	80.00	Moderate to steep grassland	19	1	V/40;VII/40	1-2	Private
MP	26N	47E	32	NW¼NW¼;W½SW¼	120.00	Moderate to steep grassland	15	1	V/20;VII/100	1-2	Private
MP	26N	47E	34	SW¼NW¼	40.00	Gently rolling grassland	14	1	VI/40	1-3-9	Public
MP	26N	47E	35	NE¼NW¼;SE¼NE¼;NE¼SW¼; E½SE¼;NW¼SE¼	240.00	Moderate to steep sage-grassland	48	1	VI/120;VII/120	1	Private
MP	26N	48E	17	S½NW¼;SW¼;W½SE¼	320.00	Moderate to steep sage-grassland	63	1	VI/120;VII/200	1	Public
MP	26N	48E	18	SE¼NE¼;S½SE¼	120.00	Moderate to steep sage-grassland	26	1	VI/60;VII/60	1	Public

McCone County

Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Present Land Use	Land Capability Classification	Principal Suitability	Proposed Management
MP	26N	48E	19	N½NE¼;SW¼NE¼;E½SW¼;W½SE¼; SE¼SE¼	320.00	Moderate to steep sage-grassland	54	1	VI/50;VII/270	1	Public
MP	26N	48E	20	NW¼;W½NE¼	240.00	Moderate to steep sage-grassland	33	1	VI/15;VII/225	1	Public
MP	26N	48E	30	Lots 1-3;E½NW¼;NE¼ NE¼SW¼;NW¼SE¼	430.67	Moderate to steep sage-grassland	85	1	VI/190;VII/161	1	Public
MP	26N	49E	5	NE¼SW¼	40.00	Gentle to moderately rolling grassland	13	1	V/25;VI/15	1-9	Public
MP	26N	49E	6	S½SE¼;SE¼SW¼	120.00	Gentle to strong rolling grassland	22	1	V/30;VII/90	1-9	Public
MP	26N	49	9	NE¼	160.00	Strong rolling grassland	19	1	VII/160	1-9	Public
MP	26N	49	27	NE¼SW¼	40.00	Moderately rolling grassland	11	1	VI/40	1	Private
MP	26N	49	34	SE¼SW¼	40.00	Strongly rolling grassland	7	1	VII/40	1	Private
MP	26N	50E	2	Lots 3,4	80.60	Strongly rolling grassland	14	1	VII/81	1-9	Public
MP	26N	50E	5	SE¼NW¼	40.00	Gently rolling grassland	12	1	V/40	1-2	Private
MP	26N	50E	28	NW¼NE¼;SE¼NW¼	80.00	Strongly rolling grassland	16	1	VII/80	1-9	Public
MP	26N	50E	30	NW¼SE¼	40.00	Gently rolling, browse-shrub rangeland	9	1	V/40	1-9	Public
MP	27N	47E	24	Lots 2,5	53.35	River bottom	11	1	VI/53	1-3-9	Public
MP	27N	48E	19	Lot 5	30.00	Gently sloping river bank	3	1	V/20;VI/10	1-2	Private
MP	27N	48E	28	Lots 3,4	57.66	Gentle to moderate sloping grassland	10	1	VI/	1-3-9	Public
MP	27N	48E	32	E½E½	160.00		21	1	VII/160	1	Private
~~MP~~	~~27N~~	~~49E~~	~~24~~	~~Lot 1~~	~~5.54~~	~~Nearly level river bottom~~	~~1~~	~~1~~	~~V/6~~	~~1~~	~~Private~~
MP	27N	50E	15	Lots 2,3	36.69	Gentle sloped river bottom	5	1	V/25;VII/12	1-3	Public
MP	27N	50E	23	Lots 1,3	37.95	Nearly level river bottom	11	1	V/38	1-3-9	Public
MP	27N	50E	25	Lots 2,3	62.77	Mod. rolling river bottom	6	1	VI/30;VII/33	1-3-9	Public

Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Present Land Use	Land Capability Classification	Principal Suitability	Proposed Management
Prairie County											
MP	16N	49E	2	SW¼NW¼	40.00	Moderately rolling grassland	9	1-6	VI/40	1-2	Private
MP	16N	49E	4	SW¼NW¼	40.00	Gently rolling grassland	11	1-6	VI/40	1-2	Private
Richland County											
MP	22N	53E	18	E½SE¼;SW¼SE¼;SE¼NE¼	160.00	Strongly rolling rangeland	30	1-4-6	VII/160	1-3-6	Public
MP	24N	51E	4	Lots 3,4	35.62	Gently to strongly rolling	7	1-4-6	VII/36	1-4-6	Private
MP	24N	51E	8	NE¼SE¼	40.00	Strongly sloping rangeland	4	1-4-6	VII/40	1-3-6	Public
MP	24N	51E	10	S½	320.00	Moderate to strongly sloping	68	1-4-6	VII/320	1-4-6	Private
MP	24N	52E	8	S½SE¼	80.00	Gently to strongly rolling	25	1-4-6	V/60;VII/20	1-6-9	Public
MP	24N	52E	26	S½NE¼;NE¼SE¼	120.00	Moderate to strongly rolling	27	1-4-6	V/25;VII/95	1-4-6	Private
MP	24N	53E	30	Lots 3,4;SE¼;W½SW¼	304.98	Gently to strongly rolling	32	1-4-6	V/90;VII/215	1-4-6	Private
MP	25N	51E	30	Lot 4;NE¼NE¼;SE¼SW¼	160.68	Gently to strongly rolling	39	1-4-6	V/15;VII/146	1-2-6	Private
MP	25N	52E	14	W½W½	160.00	Strongly rolling rangeland	30	1-4-6	VII/160	1-4-6	Public
MP	25N	56E	15	E½	320.00	Nearly level to moderate rolling	86	1-2-6	IV/144;V/32; VII/244	1-2-6	Private
MP	26N	51E	34	NW¼SE¼	40.00	Mod. rolling grassland	8	1-2-6	VII/40	1-2-6	Public
MP	26N	52E	24	SW¼SE¼	40.00	Mod. to strongly rolling	8	1-4-6	VII/40	1-4-6	Private
MP	26N	52E	25	N½NE¼	80.00	Mod. to strongly rolling	17	1-4-6	VII/80	1-4-6	Private
MP	26N	53E	15	NW¼SW¼	40.00	Strongly rolling grassland	7	1-4-6	VII/40	1-4-6	Private
MP	26N	53E	23	SW¼NE¼	40.00	Mod. rolling grassland	10	1-4-6	VII/40	1-4-6	Private
MP	26N	53E	23	SE¼SE¼	40.00	Mod. rolling grassland	10	1-4-6	VII/40	1-4-6	Private
MP	26N	53E	24	NE¼SW¼	40.00	Mod. rolling grassland	10	1-4-6	VII/40	1-4-6	Public
MP	26N	53E	21	NE¼NE¼	40.00	Strongly rolling grassland	11	1-4-6	VII/40	1-4-6	Private

Richland County

Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Present Land Use	Land Capability Classification	Principal Suitability	Proposed Management
MP	26N	53E	29	NW¼	160.00	Moderate rolling grassland	43	1-4-6	VII/160	1-4-6	Private
MP	26N	54E	5	Lot 1	42.12	Nearly level to moderate rolling	13	1-4-6	V/20;VII/22	1-2-6	Private
MP	26N	54E	6	Lot 2	42.66	Mod. rolling grassland range	12	1-4-6	VI/43	1-2-6	Private
MP	26N	54E	8	SE¼NW¼	40.00	Strongly rolling grassland	11	1-4-6	VII/40	1-2-6	Private
MP	26N	54E	17	S½SW¼;NE¼SW¼;SW¼SE¼	160.00	Strongly rolling rangeland	76	1-4-6	VII/160	1-4-6	Private
MP	26N	54E	20	N½NW¼;NW¼NE¼	120.00	Strongly rolling rangeland	76	1-4-6	VII/120	1-4-6	Private
MP	26N	55E	10	N½SE¼	80.00	Steep grassland range	21	1-4-6	VII/80	1-4-6	Private
MP	26N	55E	13	NW¼;N½SW¼;NW¼SE¼	280.00	Steep grassland range	90	1-4-6	VII/280	1-4-6	Private
MP	26N	55E	14	SE¼NE¼;NE¼SE¼	80.00	Steep grassland range	90	1-4-6	VII/80	1-4-6	Private
MP	26N	55E	21	E½NE¼;NW¼NE¼	120.00	Strongly rolling grassland	35	1-4-6	VII/120	1-4-6	Private
MP	26N	55E	23	S½NE¼	80.00	Strongly rolling grassland	24	1-4-6	VII/80	1-4-6	Private
MP	26N	55E	26	NW¼NE¼	40.00	Moderately rolling grassland	12	1-4-6	VII/40	1-2-6	Private
MP	26N	56E	4	E½SW¼;SW¼SE¼	120.00	Steep grassland range	24	1-4-6	VII/120	1-4-6	Private
MP	26N	56E	8	NE¼NE¼	40.00	Gently rolling grassland	12	1-4-6	VI/40	1-2-6	Private
MP	26N	56E	17	NW¼SE¼	40.00	Steep grassland range	11	1-4-6	VII/40	1-4-6	Private
MP	26N	56E	18	NE¼;E½SE¼	240.00	Strongly rolling rangeland	97	1-4-6	VII/240	1-4-6	Private
MP	26N	56E	19	N½NE¼;SE¼NE¼	120.00	Strongly rolling rangeland	97	1-4-6	VII/120	1-4-6	Private
MP	26N	56E	21	SE¼NW¼;SW¼NE¼;NE¼SW¼; NW¼SE¼	160.00	Mod. rolling to steep	47	1-4-6	VII/160	1-4-6	Private
MP	26N	56E	32	NE¼SW¼	40.00	Strongly rolling grassland	11	1-4-6	VII/40	1-4-6	Private
MP	26N	57E	17	SW¼NW¼	40.00	Strongly rolling grassland	12	1-4-6	VII/40	1-2-6	Private
MP	26N	57E	26	Lot 7;NW¼SW¼	86.61	Strongly sloping rangeland	26	1-4-6	VII/87	1-4-6	Private

Richland County

Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Present Land Use	Land Capability Classification	Principal Suitability	Proposed Management
MP	26N	58E	2	Lots 2, 3	72.60	Inclusive of Missouri River channel & bank	20	1-4-10	V/35;Submerged/ 41	1-2-10	Private
MP	26N	58E	3	Lot 1	3.87						
MP	26N	58E	13	SW¼SE¼;SE¼SW¼	80.00	Strong sloping	38	1-4-6	VII/80	1-4-6	Private
MP	26N	58E	15	SW¼NE¼	40.00	Steep grassland range	8	1-4-6	VII/40	1-4-6	Private
MP	26N	58E	22	S½SE¼	80.00	Mod. rolling grassland	24	1-4-6	VII/80	1-4-6	Private
MP	26N	58E	23	NE¼NE¼	40.00	Steep grassland range	38	1-4-6	VII/40	1-4-6	Private
MP	26N	58E	24	NW¼NW¼;NE¼NE¼	80.00	Strongly sloping	38	1-4-6	VII/40	1-4-6	Private
MP	26N	58E	27	N½NE¼	80.00	Strongly sloping	25	1-4-6	VII/80	1-4-6	Private
MP	26N	58E	31	NW¼NE¼;NE¼SW¼	80.00	Strongly rolling rangeland	25	1-4-6	VII/80	1-4-6	Private
~~MP~~	~~26N~~	~~59E~~	~~5~~	~~Lot 8~~	~~35.90~~	~~Within Missouri River main channel~~	~~0~~	~~3-10~~	~~Submerged/36~~	~~3-10~~	~~Public~~
MP	26N	59E	17	SW¼SW¼	40.00	Gently to moderately rolling range	32	1-4-6	VI/15;VII/25	1-4-6	Private
MP	26N	59E	18	S½SE¼	80.00	Gently to moderately rolling range	32	1-4-6	VI/10;VII/70	1-4-6	Private
MP	26N	59E	19	SE¼SW¼;SW¼SE¼	80.00	Very steep grassland range	15	1-4-6	VII/80	1-4-6	Private
MP	26N	59E	21	SW¼NE¼	40.00	Strongly rolling rangeland	11	1-4-6	VII/40	1-4-6	Private
~~MP~~	~~26N~~	~~59E~~	~~22~~	~~S½SE¼~~	~~80.00~~	~~Moderately rolling~~ grassland	~~24~~	~~1-4-6~~	~~VII/80~~	~~1-4-6~~	~~Private~~
~~MP~~	~~26N~~	~~59E~~	~~27~~	~~N½NE¼~~	~~80.00~~	~~Moderately rolling~~ grassland	~~25~~	~~1-4-6~~	~~VII/80~~	~~1-4-6~~	~~Private~~
~~MP~~	~~26N~~	~~59E~~	~~31~~	~~NW¼NE¼;NE¼SW¼~~	~~80.00~~	~~Strongly rolling rangeland~~	~~25~~	~~1-4-6~~	~~VII/80~~	~~1-4-6~~	~~Private~~
MP	27N	51E	19	Lot 4	25.80	Inclusive of Missouri River main channel & banks	1	1-3-10	IV/10;VIII/27	1-3-10	Public
MP	27N	51E	20	Lot 3	13.02	Missouri River main channel	0	10	Submerged/13	3-10	Public
MP	27N	51E	21	Lots 3,4	37.31	Inclusive of Missouri River main channel & banks	2	1-10	IV/10;Submerged/ 27	1-3-10	Public
MP	27N	51E	30	Lot 2	11.61	Missouri River main channel and banks		1-3-10		1-3-10	Public

Richland County

Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Present Land Use	Land Capability Classification	Principal Suitability	Proposed Management
MP	27N	55E	9	SW¼NE¼	40.00	Moderately rolling grassland	12	1-4-6	VI/40	1-3-6	Private
MP	27N	58E	26	Lots 2-8;SW¼SW¼;S½NW¼; SW¼NE¼	326.49)						
MP	27N	58E	27	Lots 3,4,7	96.54)	Missouri River bottomland and submerged land	114	1-4-10	V/160; Submerged/237	1-3-4-10	Public
MP	27N	58E	34	Lot 1	41.13)						
MP	27N	58E	35	Lot 2	23.00)	90 acres within Missouri-Souris Subbasin					

NOTE:

The following six pages list lands that by size and land pattern fit the description of isolated tracts and are administered by the Bureau but are not public domain. Having been acquired by purchase under the Bankhead-Jones Act their status differs sufficiently that they were inventoried but classification was not the prime goal.

LAND UTILIZATION LANDS

Prairie County

Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Land Capability Classification
BD	13N	45E	4	SW¼NE¼;S½NW¼;SE¼;E½SW¼; NW¼SW¼	400	Mod. rolling grassland	113	VI/400
BD	13N	45E	5	All	637	Mod. rolling grassland	178	VI/637
BD	13N	45E	7	Lots 1,2;NE¼;E½NW¼	321	Mod. rolling grassland	91	VI/321
BD	13N	45E	8	N½	320	Mod. rolling grassland	85	VI/320
BD	13N	45E	9	All	640	Mod. rolling grassland	167	VI/640
BD	13N	45E	10	NW¼;N½SE¼;S½NE¼	320	Mod. rolling grassland with some crested wheat	89	VI/320
BD	13N	45E	12	S½;S½N½	480	Moderately rolling grassland	133	VI/480
BD	13N	45E	15	All	640	Mod. rolling grassland with some crested wheat	170	VI/640
BD	13N	45E	18	Lots 1,2;NE¼;E½NW¼	322	Mod. rolling grassland with some crested wheat	78	VI/322
BD	13N	45E	20	All	640	Mod. rolling grassland with some crested wheat	165	VI/640
BD	13N	45E	22	N½;N½S½;S½SW¼	560	Mod. rolling grassland with some crested wheat	155	VI/560
BD	13N	45E	23	All	640	Moderately rolling rangeland	163	VI/640
BD	13N	45E	24	All	640	Moderately rolling rangeland	165	VI/640
BD	13N	46E	2	All	639	Moderately rolling rangeland	168	VI/639
BD	13N	46E	3	All	638	Moderately rolling grassland	153	VI/638
BD	13N	46E	4	All	639	Mod. rolling grassland with some crested wheat	166	VI/639
BD	13N	46E	7	All	639	Moderately rolling grassland	173	VI/639
BD	13N	46E	8	All	640	Mod. rolling grassland with some crested wheat	175	VI/640
BD	13N	46E	12	On watershed boundary between BD-MY	40	Moderately rolling grassland	6	VI/40
BD	13N	46E	15	On watershed boundary between BD-MY	100	Moderately rolling grassland	30	VI/100
BD	13N	46E	18	All	638	Moderately rolling grassland	173	VI/638
BD	13N	46E	20	On watershed boundary between BD-MY	230	Mod. rolling grassland with some crested wheat	63	VI/230

Prairie County

LAND UTILIZATION LANDS

Subbasin	TWP	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Land Capability Classification
BD	14N	45E	2	On watershed boundary between BD-LY	160	Moderately rolling grassland	35	VI/160
BD	14N	45E	2	Lots 3,4;SW¼;S½NW¼	319	Gently rolling grassland	87	VI/319
BD	14N	45E	4	All	639	Mod. rolling grassland with some crested wheat	168	VI/639
BD	14N	45E	6	Lots 1-5;S½NE¼;SE¼NW¼	316	Moderately rolling grassland	91	VI/316
BD	14N	45E	10	S½	320	Moderately rolling grassland	78	VI/320
BD	14N	45E	12	E½	320	Moderately rolling grassland	82	VI/320
BD	14N	45E	14	E½	320	Moderately rolling grassland	76	VI/320
BD	14N	45E	15	All	640	Moderately rolling grassland	154	VI/640
BD	14N	45E	24	E½	320	Moderately rolling grassland	79	VI/320
BD	14N	45E	31	All	642	Moderately rolling grassland	186	VI/642
BD	14N	46E	4	E½	319	Moderately rolling grassland	79	VI/319
BD	14N	46E	5	All	638	Moderately rolling grassland	165	VI/638
BD	14N	46E	6	Lots 4-7;S½SE¼;SE¼SW¼	290	Moderately rolling grassland	75	VI/290
BD	14N	46E	10	On watershed boundary between BD-LY	480	Mod. rolling grassland with some crested wheat	123	VI/480
BD	14N	46E	15	On watershed boundary between BD-LY	320	Moderately rolling grassland	80	VI/320
BD	14N	46E	17	All	640	Mod. rolling grassland with some crested wheat	168	VI/640
BD	14N	46E	18	Lots 1-4;E½W½	326	Mod. rolling grassland with some crested wheat	86	VI/326
BD	14N	46E	21	All	640	Moderately rolling grassland	149	VI/640
BD	14N	46E	22	On watershed boundary between BD-LY	360	Moderately rolling grassland	87	VI/360
BD	14N	46E	28	All	640	Mod. rolling grassland with some crested wheat	122	VI/640
~~BD~~	~~14N~~	~~46E~~	~~32~~	~~All~~	~~640~~	~~Moderately rolling grassland~~	~~186~~	~~VI/640~~
BD	14N	46E	34	SE¼	160	Moderately rolling rangeland	39	VI/160

LAND UTILIZATION LANDS

Prairie County

Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Land Capability Classification
BD	15N	45E	2	W½ less SE¼SE¼;SE¼SW¼	312	Mod. rolling rangeland with some crested wheat	85	VI/312
BD	15N	45E	11	E½	320	Moderately rolling grassland	83	VI/320
BD	15N	45E	12	S½	320	Moderately rolling grassland	83	VI/320
BD	15N	45E	13	All	640	Moderately rolling grassland	168	IV/40;VI/600
BD	15N	45E	15	All	640	Moderately rolling grassland	166	VI/640
BD	15N	45E	17	All	640	Moderately rolling grassland	173	VI/640
BD	15N	45E	20	N½	320	Moderately rolling grassland	93	VI/320
BD	15N	45E	22	All	640	Mod. rolling grassland with some crested wheat	168	VI/640
BD	15N	45E	23	All	640	Moderately rolling grassland	169	VI/640
BD	15N	45E	26	W½	320	Moderately rolling grassland	83	VI/320
BD	15N	45E	27	All	640	Moderately rolling grassland	168	VI/640
BD	15N	45E	28	All	640	Moderately rolling grassland	174	VI/640
BD	15N	45E	30	All	630	Mod. rolling grassland with some crested wheat	175	VI/630
BD	15N	45E	32	All	640	Mod. rolling grassland with some crested wheat	172	VI/640
BD	15N	45E	34	All	640	Mod. rolling grassland with some crested wheat	172	VI/640
BD	15N	45E	35	All	640	Moderately rolling grassland	166	VI/640
MP	15N	46E	1	All	682	Moderately rolling rangeland	179	VI/682
MP	15N	46E	2	All	685	Mod. rolling rangeland with some crested wheat	178	VI/685
MP	15N	46E	3	All	687	Moderately rolling grassland	178	VI/687
MP	15N	46E	4	All	690	Mod. rolling grassland with some crested wheat	179	VI/690
MP	15N	46E	5	On watershed boundary between MP-BD	600	Moderately rolling grassland	156	VI/600

LAND UTILIZATION LANDS

Prairie County

Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Land Capability Classification
BD	15N	46E	5	On watershed boundary between MP-BD	92	Moderately rolling grassland	24	VI/92
MP	15N	46E	6	On watershed boundary between MP-BD	87	Moderately rolling grassland	24	VI/87
BD	15N	46E	6	On watershed boundary between MP-BD	220	Moderately rolling grassland	58	VI/220
BD	15N	46E	7	All	646	Moderately rolling grassland	168	VI/646
BD	15N	46E	8	All	640	Moderately rolling grassland	172	VI/640
BD	15N	46E	9	All	640	Moderately rolling grassland	179	VI/640
BD	15N	46E	10	On watershed boundary between MP-BD	160	Moderately rolling grassland	42	VI/160
MP	15N	46E	10	On watershed boundary between MP-BD	160	Moderately rolling grassland	42	VI/160
MP	15N	46E	11	All	640	Moderately rolling grassland	160	VI/640
MP	15N	46E	12	All	640	Mod. rolling grassland with some crested wheat	179	VI/640
MP	15N	46E	13	All	640	Mod. rolling grassland with some crested wheat	167	VI/640
MP	15N	46E	14	On watershed boundary between MP-BD	160	Mod. rolling grassland with some crested wheat	39	VI/160
BD	15N	46E	14	On watershed boundary between MP-BD	160	Mod. rolling grassland with some crested wheat	39	VI/160
BD	15N	46E	15	All	640	Mod. rolling grassland with some crested wheat	181	VI/640
BD	15N	46E	17	All	640	Mod. rolling grassland with some crested wheat	167	VI/640
BD	15N	46E	20	S½;S½N½	480	Mod. rolling grassland with some crested wheat	125	VI/480
BD	15N	46E	21	All	640	Moderately rolling grassland	182	VI/640
BD	15N	46E	22	All	640	Mod. rolling grassland with some crested wheat	180	VI/640
BD	15N	46E	23	All	640	Moderately rolling grassland	180	VI/640
BD	15N	46E	24	E½	320	Mod. rolling grassland with some crested wheat	84	VI/320
BD	15N	46E	25	On watershed boundary	200	Moderately rolling grassland	50	VI/200

LAND UTILIZATION LANDS

Prairie County

Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Land Capability Classification
BD	15N	46E	26	NE¼;SE¼NW¼;N½SE¼;SE¼SE¼	320	Moderately rolling grassland	86	VI/320
BD	15N	46E	27	All	640	Moderately rolling grassland	178	VI/640
BD	15N	46E	28	E½;NW¼;E½SW¼	560	Moderately rolling grassland	147	VI/560
BD	15N	46E	29	All	640	Moderately rolling grassland	167	VI/640
BD	15N	46E	33	All	640	Moderately rolling grassland	166	VI/640
BD	15N	46E	34	All	640	Moderately rolling grassland	83	VI/320
BD	15N	46E	35	All	640	Moderately rolling grassland	167	VI/640
MP	15N	47E	2	SW¼NW¼;SE¼NE¼;S½S½; NW¼SW¼;NE¼SE¼	320	Moderately rolling grassland	88	VI/320
MP	15N	47E	4	All	648	Mod. rolling grassland with some crested wheat	175	VI/648
MP	15N	47E	5	All	646	Mod. rolling grassland with some crested wheat	175	VI/646
MP	15N	47E	6	All	626	Mod. rolling grassland with some crested wheat	17	VI/626
MP	15N	47E	7	All	635	Mod. rolling grassland with some crested wheat	169	VI/635
MP	15N	47E	8	S½	320	Moderately rolling rangeland	88	VI/320
MP	15N	47E	10	All	640	Moderately rolling rangeland	173	VI/640
MP	15N	47E	12	All	642	Moderately rolling rangeland	172	VI/642
MP	15N	47E	17	All	640	Moderately rolling grassland	168	VI/640
MP	15N	47E	18	All	626	Mod. rolling grassland with some crested wheat	166	VI/626
MP	15N	47E	19	On watershed boundary between MP-LY	311	Moderately rolling grassland	82	VI/311
MP	15N	47E	20	On watershed boundary between MP-LY	320	Moderately rolling grassland	83	VI/320
~~MP~~	~~15N~~	~~47E~~	~~22~~	~~On watershed boundary between MP-LY~~	~~160~~	~~Moderately rolling grassland~~	~~42~~	~~VI/160~~

LAND UTILIZATION LANDS

Prairie County

Subbasin	Twp	Range	Sec	Subdivision	Acres	General Land Character	AUMs	Land Capability Classification
MP	15N	48E	3	On watershed boundary between MP-LY	120	Moderately rolling grassland	31	VI/120
MP	15N	48E	6	S½	308	Moderately rolling grassland	87	VI/308
MP	15N	48E	8	On watershed boundary between MP-LY	100	Moderately rolling grassland	26	VI/100
MP	15N	48E	18	On watershed boundary between MP-LY	414	Moderately rolling grassland	124	VI/414
BD	16N	45E	6	Lots,2,7,9,10;SE¼	311	Moderately rolling grassland	97	VI/311
BD	16N	45E	10	N½	320	Moderately rolling grassland	90	VI/320
BD	16N	45E	14	N½	320	Mod. rolling grassland with some crested wheat	101	VI/320
BD	16N	45E	20	S½	320	Moderately rolling grassland	90	VI/320
BD	16N	45E	26	All	640	Mod. rolling grassland with some crested wheat	185	VI/640
BD	16N	45E	34	E½	320	Moderately rolling grassland	96	VI/320
BD	16N	45E	35	S½;NW¼	480	Moderately rolling grassland	150	VI/480
MP	16N	47E	2	Lots 1,3,4;S½NW¼;S½NE¼	302	Moderately rolling grassland	88	VI/302
MP	16N	47E	17	All	640	Moderately rolling grassland	186	VI/640
MP	16N	47E	19	N½	311	Mod. rolling grassland, mostly crested wheat	84	VI/311
MP	16N	47E	21	All except NE¼SE¼	600	Moderately rolling grassland	171	VI/600
MP	16N	47E	22	S½S½;N½SE¼;NE¼SW¼;SE¼NE¼	320	Mod. rolling grassland with some crested wheat	96	VI/320
MP	16N	47E	24	E½	320	Mod. rolling grassland with some crested wheat	93	VI/320
MP	16N	47E	28	All	640	Mod. rolling grassland with some crested wheat	170	VI/640
MP	16N	47E	31	All	625	Moderately rolling grassland	190	VI/625
MP	16N	47E	32	All	640	Mod. rolling grassland with some crested wheat	174	VI/640
MP	16N	47E	33	N½	320	Moderately rolling grassland	93	VI/320
MP	16N	47E	35	All	640	Moderately rolling grassland	168	VI/640

APPENDIX B

Section 1 Early Journals Describing Vegetation, Wildlife, Water and Erosion - Page 99

Section 2 Erosion - Piping - Page 115

Section 3 Range Plants-Frequencies and Quantities - Page 121

Section 4 Historic Land Classification - Page 125

Section 5 Digging Montana dinosaurs (An informal comment by Los Angeles County Museum personnel) - Page 133

Early Explorers and Travelers in the Big Dry Creek-Montana Pumping Area

Early journals are valuable references on the vegetation, wildlife, soils, and erosion in the years before settlement and civilization changed the ecological balance. Comparisons of the early 1800's with modern findings provide a valuable tool in management of natural resources.

1806-1806. The earliest reports on the Big Dry Creek-Montana Pumping Area were Lewis and Clark's (1805-1806). They explored the Louisiana Purchase in sufficient detail to quell politically-inspired rumors as to its worthlessness, and found a practicable way overland to the Pacific Ocean. In 1805, the two captains travelled together up the Missouri River, mapping and reporting in accordance with President Jefferson's instructions. In 1806, Lewis retraced his way down the now familiar stretch of the Missouri, while Clark explored down the Yellowstone River.

1822. Jedediah Smith and his party camped in 1822 near the mouth of the Musselshell River during the winter. Unfortunately, much of his journal has never been recovered.

1833. Alexander Maximilian, Prince of Wied Neuwied, a noted scientist assisted by his staff, collected plants and animals at Fort Union. He then travelled up the Missouri as far as the mouth of the Marias River before returning to his homeland.

1843. John Audubon, the artist-naturalist, spent the summer of 1843 at Fort Union near the mouth of the Yellowstone River.

1851. Father De Smet, a missionary, lead a group of chiefs to council at Fort Laramie in 1851. His party crossed much of the Big Dry Creek-Montana Pumping Area. Father De Smet was well educated, with an interest in the animal and plant life.

1853. Captain Isaac Stevens and his party explored the Upper Missouri River Valley in 1853, to locate feasibe routes for a transcontinental railroad. The expedition's journals are a general source of reference describing the Big Dry Creek-Montana Pumping Area.

1860. Captain William Raynolds, an Army Topographic Engineer, evaluated the Missouri Basin in 1859-1860, for wagon, rail, and river travel routes. Lieutenant Mullins of the Raynolds command, who traversed the Musselshell area, was the first.

1860. The first to follow the Yellowstone-Missouri Divide along the southern boundary of the Big Dry Creek-Montana Pumping Area and keep an accurate daily narrative was Lieutenant Mullins, in 1860. He was assigned exploration of the lands between the Missouri and Yellowstone Rivers to evaluate the route for a railroad.

1874. Lieutenant Colonel Ludlow, assisted by Lieutenant Thompson, made a reconnaissance into Yellowstone Park in 1874. They evaluated not only the Park lands, but the areas en route to Yellowstone and return.

1875. Dr. Elliot Coues, in 1875, retraced the Lewis and Clark journey, adding his own observations to their comprehensive notes.

AREA 1

The country around the junction of the Missouri River and its largest tributary, the Yellowstone River (the site of Fort Union).

Lewis and Clark Expedition - 1806 (Thwaite's editing)

April 26, 1806 (Lewis)

"....there is more timber in the neighbourhood of the junction of these rivers, and on the Missouri as far below as the White-earth river, than there is on any part of the Missouri above the entrance of the Chyenne river to this place. the timber consists principally of Cottonwood, with some small elm, ash and boxalder. the under growth on the sandbars and verge of the river is the small leafed willow; the low bottoms rose bushes which rise to three or four fe(e)t high, the redburry, servicebury, and the redwood; the high bottoms are of two discriptions, either timbered or open; the first lies next to the river and it's under brush is the same with that of the low timbered bottoms with the addition of the broad leafed willow, Goosbury, choke cherry, purple currant, and honeysuckle bushis; the open bottoms border on the hills, and are covered in many parts by the wild hyssop which rises to the hight of two feet. I observe the Antelope, Buffaloe Elk and deer feed on this herb; the willow of the sandbars also furnish a favorite winter food to these anamals as well as the growse, the porcupine, hare, and rabbit."

April 26, 1805 (Clark)

"....., & in my walk Shot a beaver & 2 Deer, one of the Deer in tolerable order, the low bottom of the river is generaly covered with wood(,) willows & rose bushes, red berry, wild cherry & red or arrow wood intersperced with glades The timber is Cottonwood principally, Elm small ash also furnish a portion of the timber.

"....., the bottoms on either side is wooded with Cotton wood, ash, Elm, & near the banks of the river back is higher bottoms and covered with red berry, Goose berry & rose bushes & interspersed with....."

"..... emence numbers of antelopes in the forks of the river, Buffalow & Elk & Deer is also plenty. beaver is in every bend. I observe that the Magpie Goose duck & Eagle all have their nests in the same neighbourhood, and it is not uncommon for the Magpie to build in a few rods of the eagle, the nests of this bird is built verry strong with sticks covered verry thickly with one or more places through which they enter or escape, the Goose I make no doubt falls a pray to those vicious eagles...."

April 27, 1806 (Lewis)

"..... beaver are very abundant,the party kill several of them every day. The Eagles, Magpies, and gees have their nests in trees adjacent to each other; the magpy particularly appears fond of building near the Eagle, as we scarcely see an Eagle's unaccompanyed with two or three Magpies nests within a short distance. The bald Eagle are more abundant here than I ever observed them in any part of the country."

August 2, 1806 (Clark)

Returning down the Yellowstone and near its mouth.

"..... Saw emence numbers of Elk Buffalow and wolves today. the wolves do catch the elk. I saw 2 wolves in pursute of (a) doe Elk which I beleive they cought."

"..... I have noticed a great preportion (of) Buck Elks on this lower part of the river,and but very fiew above. those above which are emencely noumerous are feemales Generally. Shields killed a Deer this morning dureing the time we were at Brackfast. we were very near being detained by the Buffalow to day which were crossing the river we got through the line between 2 gangues."

August 3, 1806 (Clark)

At the mouth of the Yellowstone

"..... on the side of this bluff I saw some of the Mountain Bighorn animals. I assended the hill below the Bluff. the Musquetors were so noumerous that I could not Shute with any certainty and therefore soon returned to the Canoes. I had not proceeded far before I saw a large gangue of ewes & yearlins & fawns or lambs of the big horn, and at a distance I saw a ram. landed and Sent ech to kill the ram, which he did kill and brought him on ....."

July, 1833 (Prince Maximilian)

Of the area around Fort Union

"..... The hills were partly bare, and very few flowers were in blossom; the whole country was covered with short, dry grass, among which were numerous round spots with tufts of Cactus ferox, which was only partly in flower. Another cactus, resembling mammillaris, with dark red flowers, yellow on the inner side, was likewise abundant."

"..... Between the hills, there are, sometimes, in the ravines, little thickets of oak, ash, negundo maple, elm, bird-berry, and some others, in which many kinds of birds, particularly the starling, black-bird, &c., build their nests. The king bird and the red thrush are likewise found. Of mammalia, besides those in the river, namely, the beaver, the otter, and the muskrat, there are, about Fort Union, AREA 1 (continued)

in the prairie, great numbers of the pretty little squirrel, the skin of which is marked with long stripes, and regular spots between them (Spermophilus Hoodii, Sab.), ... Besides these, there are several kinds of mice, particularly Mus leucopus. The flat hills of the goffer (sic - gopher) are likewise seen; this is a kind of large sand rat, living underground, ..."

AREA 2

RIVER TRAVEL

April 28, 1805 (Biddle's editing)

"The woods are now green, but the plains and meadows seem to have less verdure than those below.

"Game is very abundant - the common, and the mule or black-tailed deer, elk, buffalo, antelope, brown bear, beaver, and geese. The beaver have committed great devastation among the trees, ..."

April 29, 1805

"We are surrounded with deer, elk, buffalo, antelopes, and their companions the wolves, which have become more numerous and make great ravages among them. The hills are here much more rough and high, and almost over-hang the banks of the river."

May 1, 1805

"The country around is more pleasant than that through which we have passed for several days, the hills being lower and the low ground wider and better supplied with timber, which consists principally of cottonwood. The undergrowth is willow on the banks and sand-bars, rose-bushes, red-willow, and the broad-leaved willow in the lower plains, while the high country on both sides is one extensive plain, without wood, though the soil is a dark, rich, mellow loam."

August 7, 1806 (Lewis)

"..... In passing Martha's river (Big Muddy Creek), we observed that its mouth is at present a quarter of a mile lower than it was last year..... At this place also are the first elms and dward cedars in the bluffs of the river..... The whole country on the northeast side, between Martha and Milk rivers, is a beautiful, level plain, with a soil much more fertile than that higher up on the river. The buffalo, elk, and other animals continue numerous, as are also the bears, ..."

AREA 3

RIVER TRAVEL

May 3, 1805: Near mouth of Poplar River

"We saw vast quantities of buffalo, elk, deer, principally of the long tailed kind, antelope, beaver, geese, ducks, brant, and some swan. The porcupines too are numerous, and so careless and clumsy that we can approach very near without disturbing them, as they are feeding on the young willows.

"At a little distance from the river there is no timber on either side, the wood being confined to the margin of the river; so that unless the contrary is particularly mentioned, it is always to be understood that the upland is perfectly naked, and that we consider the low grounds well timbered if even a fifth be covered with wood. The wild licorice (Glycyrrhiza lepidota) is found in great abundance on these hills, as is also the white-apple (Psoralea esculenta). As usual, we are surrounded by buffalo, elk, common and black-tailed deer, beaver, antelopes, and wolves."

AREA 3 - OVERLAND TRAVEL ALONG THE MISSOURI

August 15, 1853 (Captain Stevens)

Near mouth of Poplar River

"Crossed Poplar River, and encamped on the west side; excellent water and grass."

August 18, 1853: Mouth of the Porcupine River

"Passed through to-day villages of prairie dogs.

"Wild horses were reported as having been seen to-day by the Reconnoitring parties."

July 26, 1860 (Raynold's Expedition)

Raynolds found some game to be plentiful, but buffalo were scarce:

"....to-day deer and elk have been started at almost every turn of the river. A few buffalo bulls have also been visible, but no large bands, notwithstanding the fact that a few years since this was one of their great feeding grounds."

Of vegetation and the silt load of the Missouri River:

"....the water is fast taking on its proverbially muddy appearance. The valleys widens and contains more timber, while the immediate river banks are sharply cut and perpendicular, the strata showing the deposits of successive overflows."

AREA 4

RIVER TRAVEL

May 9, 1805 (Lewis and Clark)

At mouth of Big Dry River

"....we reached the bed of a most extraordinary river, which presents itself on the south. Though as wide as the Missouri itself, that is, about half a mile, - it does not discharge a drop of water, and contains nothing but a few standing pools.

"I (Lewis) killed four plover (Catoptrophorus semipalmatus enernatus) this evening of a different species from any I have yet seen;....

"For several days past the river has been as wide as it generally is near its mouth; but as it is much shallower, crowded with sand-bars, and the color of the water has become much clearer, ..."

AREA 4 - RIVER TRAVEL (continued)

August 3, 1806 (Lewis)

Big Dry, Milk, and Little Dry Rivers

"....[deer] are in great abundance in the river-bottoms, and very gentle. We passed also a great number of elk, wolves, some bear, beaver, geese, a few ducks, the party-colored corvus (magpie, Pica pica hudsonica), a calumet eagle, some bald eagles, and red-headed woodpeckers (Melanerpes erythrocephalus), but very few buffalo.

August 4, 1806

"....At eleven we passed the Bigdry river, which has now a bold, even, but shallow current, 60 yards in width, and halted for a few minutes at the mouth of Milk river. This stream is at present full of water, resembling in color that of the Missouri; .... We here killed a very large rattlesnake. Soon after we passed several herds of buffalo and elk, ..."

AREA 5 RIVER TRAVEL

May 12, 1805 (Lewis and Clark)

Between Big Dry and Musselshell Rivers

"On both sides of the river the country is rough and broken, the low grounds becoming narrower; the tops of the hills on the north exhibit some scattered pine and cedar; on the south the pine has not yet commenced, though there is some cedar on the sides of the hills and in the little ravines. The choke-cherry, the wild hysop, sage, fleshy-leaved thorn, and particularly the aromatic herb on which the antelope and hare feed are to be found on the plains and hills.

"The game is now in great quantities, particularly the elk and buffalo, which the last is so gentle that the men are obliged to drive them out of the way with sticks and stones. The ravage of the beaver are very apparent;...."

Colonel Ludlow, traveling upstream in 1875, made the following observation about conditions above Fort Peck:

"....game became more abundant. Glimpses of deer half concealed in the shrubbery were frequently caught; large bands of elk were seen in the timbered points; and the shore of the river was everywhere dotted with the footprints; farther upstream buffalo swam across the river."

AREA 6

RIVER TRAVEL

May 17, 1805 (Lewis and Clark)

Mouth of the Musselshell River

"The country in general is rugged; the hills are high, with their summits and sides partially covered with pine and cedar, and their bases on both sides washed by the river. The timber on the river consists of scarcely anything more than a few scattered cottonwood trees.

"The game is in great quantities, but the buffalo are not so numerous as they were some days ago; two rattlesnakes (Crotalus confluentus) were seen today,...."

May 20, 1805: Of the country in the Musselshell drainage judging by its mouth:

"...., that the timber of which the Indians speak ....consists of nothing more than a few straggling small pines and dwarf cedars on the summits of the hills, nine-tenths of the ground being totally destitute of wood, and covered with short grass, aromatic herbs and an immense quantity of prickly-pear (Opuntia fragilis)."

At its mouth the Musselshell had more water than most of the local streams. Its mouth was 110 yards wide with banks rising nearly twelve feet.

AREA 6 - RIVER TRAVEL (continued)

May 20, 1805

"....the water is of a greenish-yellow cast; and much more transparent than that of the Missouri, which itself, though clearer than below, still retains its whitish hue and a portion of its sediment."

May 21, 1805

Rangeland opposite the Musselshell mouth - north of the Missouri River

"....a fertile soil which, though without wood, produces a fine turf of low grass, some herbs, and vast quantities of pricklypear...."

Of the Musselshell Area

"The country on the south is high, broken, and crowned with some pine and dwarf cedar;....

"During the whole day the bends of the river are short and sudden; the points are covered with some cottonwood, large or broad-leaved willow, and a small quantity of redwood; the undergrowth consisting of wild roses and the bushes of the small honeysuckle."

AREA 6 - OVERLAND TRAVEL ALONG THE MISSOURI

Winter, 1822 (Jedediah Smith)

Near mouth of Musselshell River, but southeast. Despairing of living in an area with little game:

"....we were astonished to see the buffalo come pouring from all sides into the valley of the Missouri and particularly the bast Bands that came from the north and crossed over to the south side on the ice. We therefore had them in thousands around us and nothing more required of us than to select and kill the best for our use whenever we might choose."

AREA 7

OVERLAND TRAVEL

On July 28, 1860, Lt. Mullins crossed the Musselshell River near the southern boundary of Big Dry Creek-Montana Pumping Area.

"....a bold, beautiful stream, about 25 or 30 yards wide, with a fine valley, which was diversified by the appearance of groves of cottonwood.... The country east and south of us seems very much broken, with constant appearance of pine and cedar reefs. From this point, as far as the eye could reach, the country seemed covered with immense herds of buffalo, all moving toward the valley of the Yellowstone.... The grass being tolerably good, I determined to lie here to-morrow...."

July 30, 1860 (Mullins continued)

"July 30.-Continued our march....of a barren, rough country. Passed a number of herds of buffalo, who seemed to have eaten off every sprig of grass; we met with no water after leaving camp, until after a march of 23 miles we camped near the bed of a small creek containing water in holes; no grass, and but little wood. ....During the night we were much annoyed by the buffaloes running through camp."

July 31, 1860: Mullins moved to high cedar "reefs." Along the Porcupine River (the tributary to Yellowstone River - not those into the Missouri) he saw numerous herds of buffalo and complained of the undrinkable water.

"....Large herds of buffalo were visible in the different valleys.

"....all the valley, being filled with buffalo, presented a striking variety in natural scenery.

(Camping) "....I found better grass and purer water, although I estimated that one-third of the fluid that we dignified by the name of water was buffalo urine."

In August the party moved up to the Missouri-Yellowstone Divide.

"....The whole country traversed to-day was dry and barren; no wood, water, nor grass; the latter having been entirely eaten off by the buffaloes.

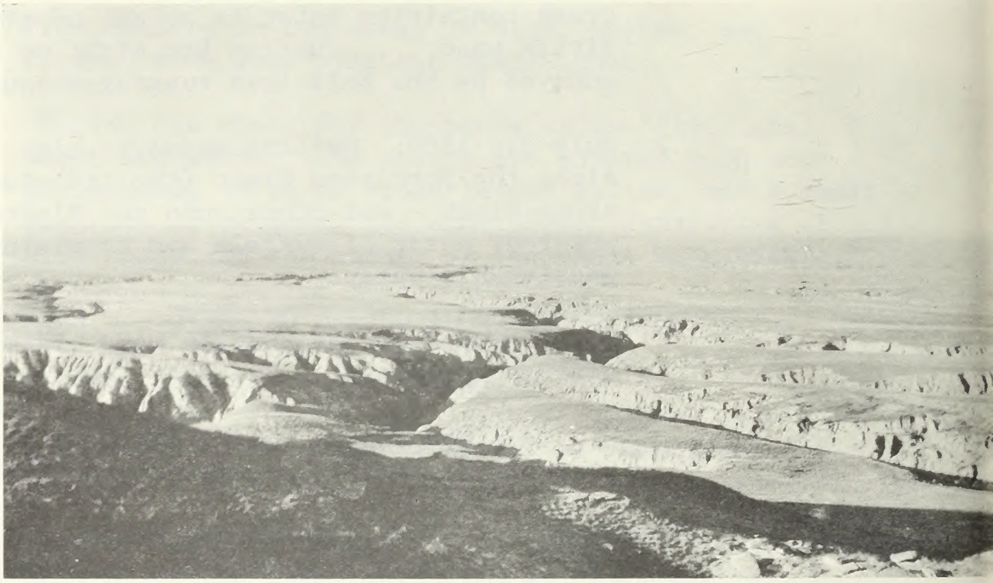
I now began to feel quite uneasy about by animals and feared seriously that they would not be able to make the trip; near the divide two animals broke down and I was compelled to leave them behind. Fortunately I found a camping place near some large holes of brackish water, but we had very little wood or grass...."

AREA 8

OVERLAND TRAVEL

August 7, 1851 (Father De Smet)

He commented on the numerous veins of coal in the country in the Big Dry area, then south of the divide:



"....we crossed lands intersected with numerous ravines and dried streams. The soil was much lighter than that we last trod; it was covered with a species of wild artemisia, or wormwood - an infallible mark of sterility."

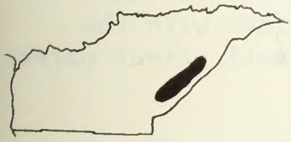
In 1851 the wagons of Father De Smet had hard going over these typical incised drainages. Further westward this cutting is not so pronounced. It was 9 years later in this same area Mullins noted it was dry range cut by ravines and dry creek beds. The route was chosen for defense against a large group of 300 Crow Indians who were not friendly toward white men. Mullins' camp was on a dry creek, "water poor; grass scarce."

August 5, 1860 (Mullins)

On the broken country of the divide, Mullins was cheered by a change in the country.

"August 5.-....I was gratified to observe the great change that took place in the country as we travelled eastward. The soil became better, grass more plenty and of better quality, and wood and water in the ravines....encamped at a clear, cold spring,....Plenty of cottonwood and black ash timber, and excellent grazing for the animals.....the country toward the Missouri broke off from the divide by precipitous bluffs; the drainage marked by deep ravines, all having more or less timber in them.

AREA 9 OVERLAND TRAVEL ACROSS THE INTERIOR



August 3, 1851 (Father De Smet)

Near the divide between the Yellowstone and Missouri Rivers

"....the whole space between the Missouri and the Yellowstone was covered by buffalo as far as the eye could reach.

"A good hunter might easily kill here, in the course of a day, several cows, deer, a mountain-goat, a red-tailed and a black-tailed buck, an antelope, hares, and rabbits. He might fire twice upon a grizzly bear, and perhaps meet a gray and silver fox. To this list of animals we may add the beaver, otter, badger, prairie-dog, and several kinds of wild fowl, principally pheasants and grouse." (He comments on the groves of cottonwoods, elm, ash, "servicetrees," and cherry trees and on the "luxuriant verdure.")

August 11, 1860 (Lt. Mullin)

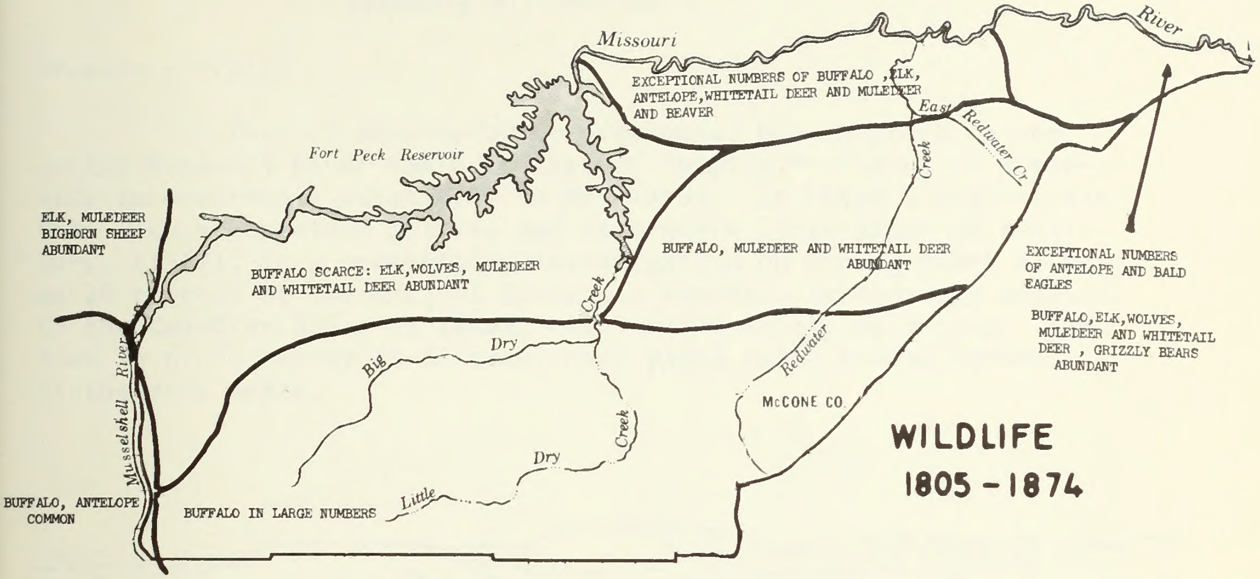
At Fort Union, summing up over 700 to 800 miles of travel from Fort Benton to Fort Union.

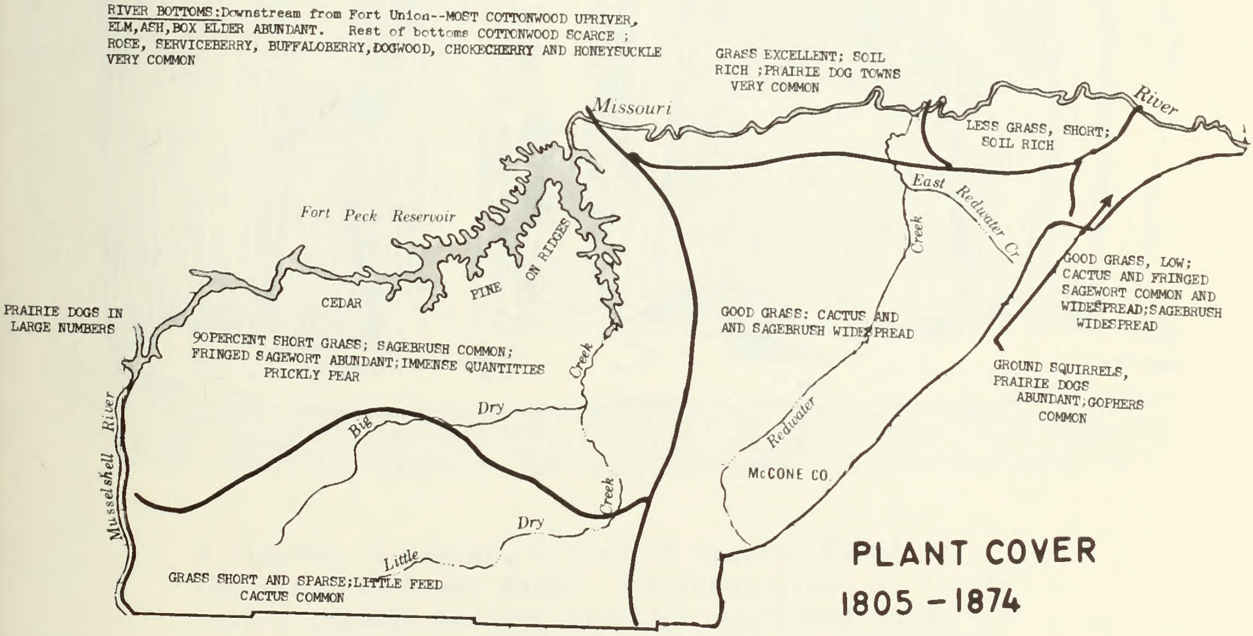
"The country passed over on my route, with the exception of that portion in and near the Judith mountains, and lying contiguous to the streams forming the drainage of the same, is worthless."

Narratives covering the Big Dry Creek-Montana Pumping Area in the country between Big Muddy Creek and Poplar River (and westward to the Milk River on the north shore of the Missouri River) agree that here big game was encountered in its greatest concentrations. Buffalo, elk, whitetail deer, mule deer, and antelope occurred there on what was described as a beautiful level plain with the soil much more fertile than upriver, with excellent grass, and the land well-timbered. By no coincidence this also is the general area (within the report area) with the highest amounts of precipitation, both annual and during the growing season. The same big game species also were found in abundance immediately eastward at the junction of the Yellowstone River with the Missouri River, but not in such overwhelming numbers. This intermixing of so many individual species is not reported elsewhere in the Big Dry Creek-Montana Pumping Area.

The maps summarizing the narratives and journals indicate variations in the relative abundance of game species correlate with the topography and vegetation)both greatly influenced by soil parent material and climate).

Pricklypear cactus and fringed sagewort, often considered an indication of poor range management, are mentioned prominently. We have found some plants, such as pricklypear cactus, are more dependent for their abundance on vagaries of the weather; and, in Montana, that sagebrushes are far more dependent on soil types than on any grazing factors. Another recurrent comment is one on large numbers of prairie dog towns, or of the animals themselves. Substantiating records and investigations support a picture of rangeland not too different from that of today. Good range then is good range now. The good old days of rangeland prove to be often more fable than fact. The vast game herds, a fact once, have disappeared, but with the potential still here and the interest in recreation ever increasing, we may witness a continuing renaissance of wild life numbers.

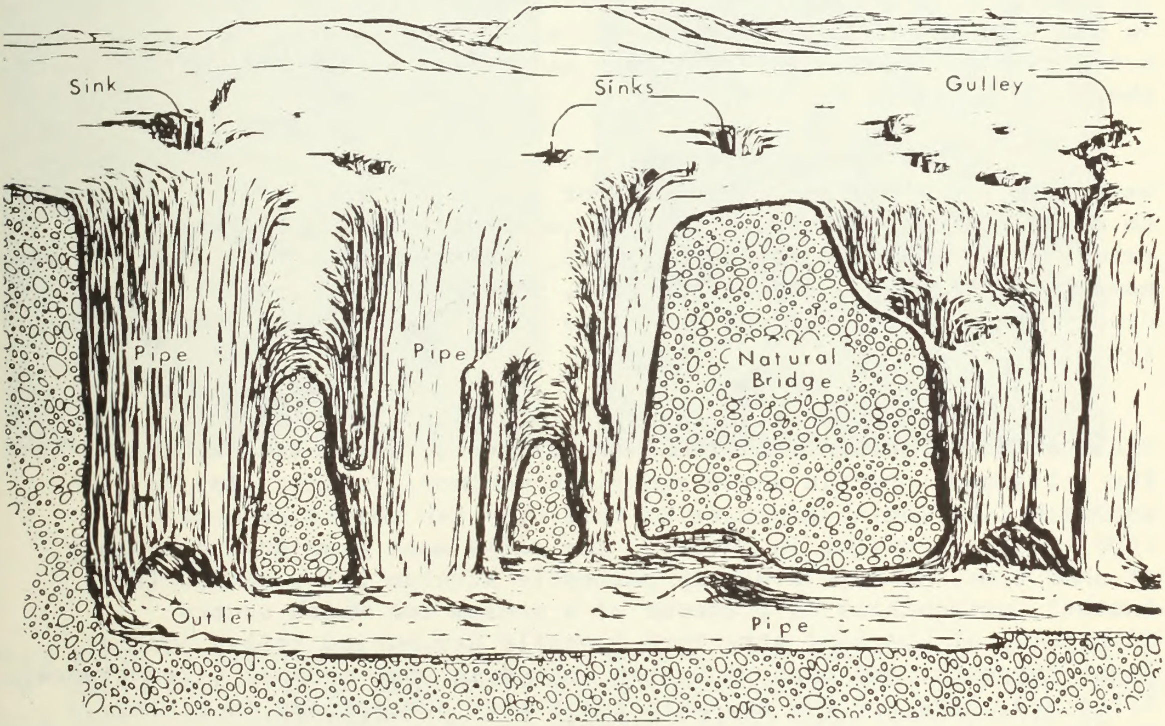

Missouri
River
Fort Peck Reservoir
ELK, MULEDEER BIGHORN SHEEP ABUNDANT
EXCEPTIONAL NUMBERS OF BUFFALO, ELK, ANTELOPE, WHITETAIL DEER AND MULEDEER AND BEAVER
East Redwater Cr
Creek
BUFFALO SCARCE: ELK, WOLVES, MULEDEER AND WHITETAIL DEER ABUNDANT
BUFFALO, MULEDEER AND WHITETAIL DEER ABUNDANT
EXCEPTIONAL NUMBERS OF ANTELOPE AND BALD EAGLES
BUFFALO, ELK, WOLVES, MULEDEER AND WHITETAIL DEER, GRIZZLY BEARS ABUNDANT
Creek
Big Dry
Redwater
Musselshell River
McCONE CO.
Creek
Dry
WILDLIFE
1805 - 1874
BUFFALO, ANTELOPE COMMON
BUFFALO IN LARGE NUMBERS
Little


RIVER BOTTOMS: Downstream from Fort Union--MOST COTTONWOOD UPRIVER, ELM, ASH, BOX ELDER ABUNDANT. Rest of bottoms COTTONWOOD SCARCE; ROSE, SERVICEBERRY, BUFFALOBERRY, DOGWOOD, CHOKECHERRY AND HONEYSUCKLE VERY COMMON
GRASS EXCELLENT; SOIL RICH; PRAIRIE DOG TOWNS VERY COMMON
Missouri
River
LESS GRASS, SHORT; SOIL RICH
East Redwater Cr
Fort Peck Reservoir
ON RIDGES
PINE
CEDAR
Creek
PRAIRIE DOGS IN LARGE NUMBERS
GOOD GRASS, LOW; CACTUS AND FRINGED SAGEWORT COMMON AND WIDESPREAD; SAGEBRUSH WIDESPREAD
GOOD GRASS: CACTUS AND AND SAGEBRUSH WIDESPREAD
90PERCENT SHORT GRASS; SAGEBRUSH COMMON; FRINGED SAGEWORT ABUNDANT; IMMENSE QUANTITIES PRICKLY PEAR
Creek
GROUND SQUIRRELS, PRAIRIE DOGS ABUNDANT; GOPHERS COMMON
Big Dry
Musselshell River
Redwater
McCONE CO.
Creek
Dry
Little
PLANT COVER
1805 - 1874
GRASS SHORT AND SPARSE; LITTLE FEED CACTUS COMMON

APPENDIX B - Section 2

Erosion - Piping

A form of erosion often overlooked but inherent to the entire Missouri River Basin is that of "piping." Piping is world-wide in occurrence especially in dry lands. It takes a destructive form with steep-sided gullies and lays waste large areas of soil. Burr, (1942), in a preliminary investigation on piping found as much as 20 percent of the area of livestock ranches, immediately adjacent to the Canadian River in Texas, were eroded solely by piping. The loss in productivity is drastic; many piped areas become barren, picturesque waste.



A diagram of piping, a form of erosion found in the Missouri River Basin. Vertical pipes of "sinks" outlet through horizontal pipes developed on an impermeable layer, into a gully, itself formerly a horizontal pipe. The gully developed by collapse of natural bridges. Topography of this nature is termed a "pseudokarst."

The worst problem is the difficulty of control. Other forms of erosion are normally controlled by vegetation or by surface structures designed to slow the transportation of soil particles. Water erosion is combated by terraces, water spreading, and check dams; wind erosion is controlled by plant barriers and occasionally artificial barriers. With piping, which depends solely on water, a structure such as a terrace or dam will only aggravate the problem and have disastrous results.

Parker and Jenne[1] state: "...Piping is the development of subsurface drainage systems in earth materials, to a depth no greater than the nearby base level of drainage. It results in a surface expression much like miniature solution depressions in limestone or dolomite terrains..." This resemblance is in appearance only. Solution plays no important part in development of piping. The erosion forms resulting are termed pseudokarst. (True karst topography is found in limestone or dolomite regions where, unlike piping, solution of rock in water is the creative force. Sinks, caverns, natural bridges, subterranean streams, sheer cliffs, and a general lack of surface water characterize karst terrain.)

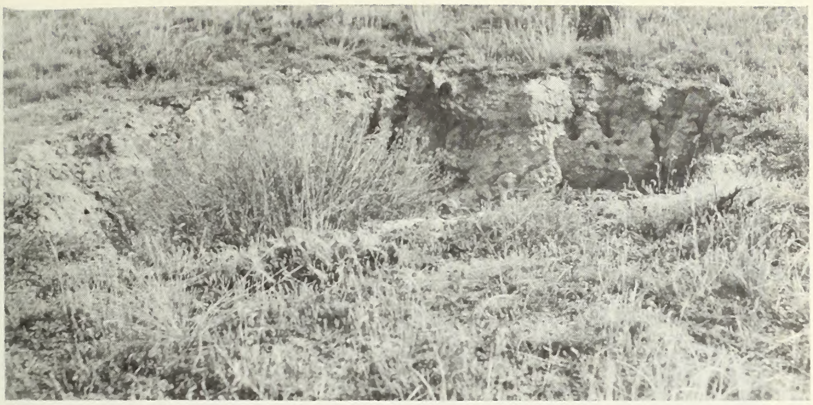
As has been stated, all the Missouri River subbasins, without exception, have the prerequisites for piping, "...Sufficient water either to cause drainage through cracks or to saturate a layer of higher permeability than the layers below it, hydraulic head sufficient to move water through a subsurface rock, presence of a permeable (or deeply cracked) soil or bedrock above gully floor level, and an outlet for flow..." 2/

The soils most susceptible to piping are found in all the Missouri River subbasins. These are alluvial, often saline, soils. The soils must contain about one-fifth montmorillonitic clay (a sandwich-like ionic structure in this clay can absorb as much as 1600 times its weight in water). The soils must also dry thoroughly, at some time, or have a highly permeable stratum below the surface. Another prerequisite is presence of a sodium ion which causes dispersion of the soil structure (locally dry buried soils, such as loess deposits, may also pipe when wetted in some unusual circumstance). Silts and clays are the two main soils most susceptible to piping. Conditions favoring piping are so widespread that it is a serious problem in management of range lands and especially in the establishment of artificial structures such as dams or roads.

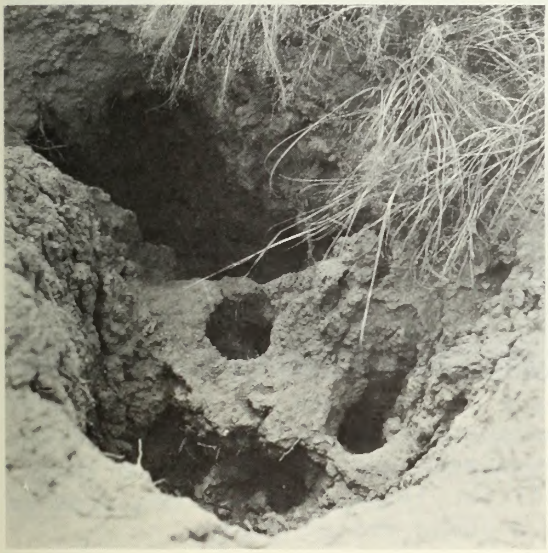
1/ Structural Failure of Western U. S. Highways Caused by Piping, U. S. Geological Survey, January 18, 1967, Parker, G. G., and Jenne, E. A.

2/ Ibid.

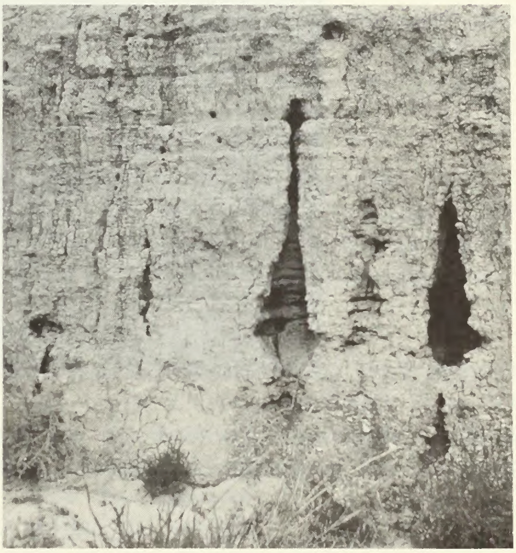
A



B

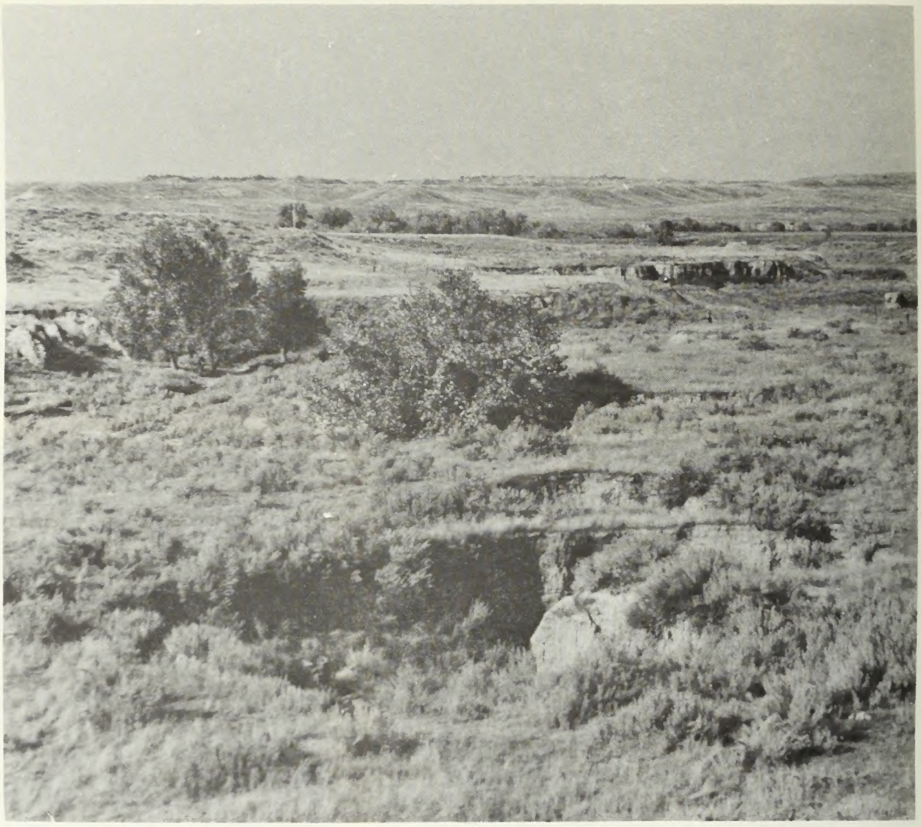


C

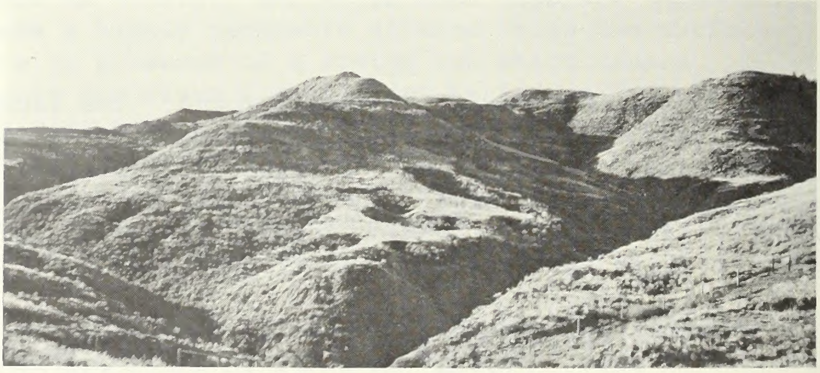


Piping often originates on fairly level ground. The large vertical pipe in "A" could have started when water runoff percolating downward encountered a long buried and dessicated lens of loess or silt, that upon saturation collapsed into a smaller space. The collapse would have been followed by a subsidence of the surface. Looking downward into a large pipe "B" shows a subsidence in which vertical pipes developed later.

Dry soils susceptible to piping usually develop wide deep cracks that extend downward several feet. Piping can start in these cracks even on steeply sloping soils. Surface runoff pouring down the crack enlarges it by cutting until a layer is reached where horizontal pipes must develop, then the water usually outlets into an arroyo or gully, such as that in "C", where the stream has now cut away its channel wall to reveal cross sections of vertical pipes.



This gully is actually a collapsed horizontal pipe bridged over by a series of broad natural bridges of soil still in place. Eventually these collapse into a sheer walled gully.



Sinks join together in gullies in mid-distance. These sinks were formed by collapse and subsidence of subsurface pipes which riddle the soil.

The most common type of piping encountered in the Big Dry Creek-Montana Pumping Area is one where cracks are formed by a soil drying and shrinking. Runoff enters this crack at the soil surface and moves down eroding the walls. If the hydrologic gradient is steep a fine-grained sediment may be transported in suspension along this vertical crack, then through a horizontal crack into an outlet on the side slope of an arroyo or gully. Cracks are the usual starting point for a pipe; sediment deposits, however, such as loess below the surface, may be moistened to saturation and slump to start infiltration into a small sink. The start is like that

Construction such as a dam or wall confines water behind a barrier, creating hydraulic heads that can start a subsurface flow carrying water-saturated earth materials. This discharges on the down side of the barrier. The Bureau of Land Management and other land management groups encounter this entrainment type of piping in construction of stock or erosion control dams on soils or base material susceptible to piping. Once piping starts the overlying structure will often collapse.

A third type of piping is similar to the entrainment type. In this a hydraulic head transports clay and silt and sand through a stratum with sufficient velocity to maintain its identity and discharge them into a gully. These gullies are formed and enlarged through collapse and coalescence of the piped structures,

Piping can form extensive networks of caves. In badlands on the headwaters of the North Platte River, pipes in a clay derived from saline shales extend for miles in tubes from 8 to 12 feet in diameter. These pipes ramify throughout the entire area, and spectacular scenery is often formed by collapse of the tubes.

APPENDIX B - Section 3

Range Plants Occurring in Big Dry Creek-Montana Pumping Area

The following table shows the number of times each species occurred in 1,300 observations. It also shows the number of times each species made up 15 percent or more of the total vegetation. (See The Public Lands, Range Vegetation Section.)

COMMON NAME	TOTAL OCCURRENCES IN 1,300 OBSERVATIONS	OCCURRENCES WHERE SPECIES PRODUCED OVER 15% OF THE VEGETATION
WESTERN WHEATGRASS	1,170	899
BLUE GRAMA	1,145	761
NEEDLEANDTHREAD	1,125	757
SEDGES	1,055	166
FRINGED SAGEBRUSH	908	5
BEARDED BLUEBUNCH WHEATGRASS	789	365
BIG SAGEBRUSH	785	144
GREEN NEEDLEGRASS	744	90
PRAIRIE JUNEGRASS	743	2
BROOM SNAKEWEED	703	2
SILVER SAGEBRUSH	697	7
PRAIRIE SANDREED	690	23
PLAINS PRICKLYPEAR	652	
STONYHILLS MUHLY	602	48
SANDBERG BLUEGRASS	559	52
LITTLE BLUESTEM	559	52

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COMMON NAME	TOTAL OCCURRENCES IN 1,300 OBSERVATIONS	OCCURRENCES WHERE SPECIES PRODUCED OVER 15% OF THE VEGETATION
COMMON WINTERFAT	448	
PLAINS REEDGRASS	428	1
HOODS PHLOX	327	
SALTBUSH	326	
SMALL SOAPWEED	323	
INLAND SALTGRASS	265	25
SKUNKBUSH SUMAC	230	
ROSES	211	
SNOWBERRIES	198	
RUBBER RABBITBRUSH	193	1
GLOBEMALLOWS	190	
CURLYCUP GUMWEED	159	
SWEETCLOVERS	153	9
CREEPING JUNIPERS	152	
INDIAN RICEGRASS	152	
BRIOGONUM	146	
SILVER BUFFALOBERRY	144	
FLEABANES	138	
JUNIPERS	135	
WOOLLY INDIANWHEAT	134	
LOCOS	134	
TUMBLEGRASS	132	2
LUPINES	118	
SIDEOATS GRAMA	116	3
KNOTWEEDS	115	
ALKALI SACATON	114	2

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COMMON NAME	TOTAL OCCURRENCES IN 1,300 OBSERVATIONS	OCCURRENCES WHERE SPECIES PRODUCED OVER 15% OF THE VEGETATION
PRAIRIECLOVER	104	
RED THREEAWN	96	
LEMON SCURFPEA	93	
BLACK GREASEWOOD	85	
MONOLEPIS	82	
THISTLES	78	
PONDEROSA PINE	70	
PLAINS COTTONWOOD	70	
CRESTED WHEATGRASS	66	10
FOXTAIL BARLEY	66	3
CHEATGRASS BROME	66	2
WESTERN YARROW	63	
ANNUAL SUNFLOWERS	62	

COMMON NAME	TOTAL OCCURRENCES IN 1,300 OBSERVATIONS	OCCURRENCES WHERE SPECIES PRODUCED OVER 15% OF THE VEGETATION
ASTERS	55	
BOTTLEBRUSH SQUIRRELTAIL	48	1
CANADA WILDRYE	45	
CHOKECHERRY	42	
DEATHCAMAS	41	
ASH	40	
CRAZYWEED	40	
SIXWEEKS FESCUE	39	1
SALSIFY	39	
PRAIRIE CORDGRASS	36	2
RUSHES	32	
GOLDENEYE	31	
HAIRY GOLDMASTER	30	
ROCKY MOUNTAIN JUNIPER	30	

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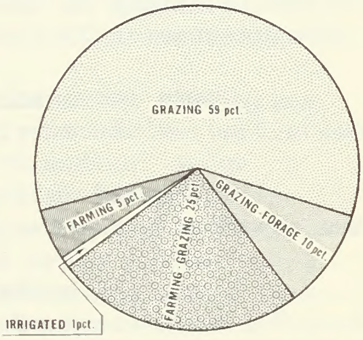
COMMON NAME	TOTAL OCCURRENCES IN 1,300 OBSERVATIONS	OCCURRENCES WHERE SPECIES PRODUCED OVER 15% OF THE VEGETATION
KENTUCKY BLUEGRASS	28	
PUSSYTOES	28	
LITTLEFLOWER COLLINSIA	23	
GOLDENROD	23	
COMMON RUSSIAN THISTLE	23	
WILLOW	22	
DOTTED GAY-FEATHER	21	
AMERICAN LICORICE	20	
THICKSPIKE WHEATGRASS	20	
SUMMERCYPRESS	18	
MUSTARD	14	
ROCKY MOUNTAIN MAPLE	13	
POVERTY SUMPWEED	12	
CURRANTS	12	
DOCK	11	
ONIONS	11	
SWITCHGRASS	10	
JAPANESE BROME	8	
FLAX	8	
STEMLESS GOLDENWEED	7	
ALKALI CORDGRASS	6	1
PENSTEMON	6	
VETCH	5	
LITTLEFLOWER DEERVETCH	5	
BLACK NIGHTSHADE	4	
CINQUEFOIL	4	
CRYPTANTHA	4	
COMMON DANDELION	2	
COCKLEBURRS	2	
BIG BLUESTEM	2	
MEADOW FOXTAIL	2	
BUFFALOGRASS	1	

APPENDIX B - Section 4

Land Classification Reconnaissance (Circa 1924) 1/

The U. S. Geological Survey classified lands of the Northern Great Plains into three use classes - lands productive under irrigation, by dry-farming, or by grazing. Dry-garming lands were subdivided into three subclasses; farming, farming-grazing, and grazing-forage. Grazing lands were subdivided into two subclasses; tillable and non-tillable. The 1924 USGS Use Classes are comparable in intent with today's Land Capability Classes. The definitions of use classes appear at the end of this section. A map, page 52 and the accompanying graph, summarize the Geological Survey's findings.

LAND CLASSIFICATION (1924)



Range Vegetation in Land Classification (1924)

The vegetation was divided into characteristic associations. In computing carrying capacity, the Geological Survey estimated a grazing season of from 5 to 7 months yearly. Their figures given in animal units per section are generalizations and have been converted to the more common "acres per animal unit month" (A/AUM), to aid comparison with recent findings.

Plant cover associations described by the Geological Survey were as follows:

Grama grass association, a predominantly short grass type found on the farming-grazing land, with a carrying capacity of 3½ to 6½ A/AUM.

Grama and needlegrass association, a more productive type, with carrying capacity of 1½ to 3½ A/AUM.

Grama and threadleaf sedge association, an important indicator of definicient soil moisture on shallow, rocky or gravelly soils; carrying capacity of 3½ to 6½ A/AUM, and usually classed as farming-grazing land.

1/ Land Classification of the Northern Great Plains, Montana, North Dakota, South Dakota, and Wyoming, U. S. Geological Survey 1929. Unnumbered.

Grama and western wheatgrass association, characteristic of the heavy clay loams, usually indicating farming-grazing or grazing-forage land; carrying capacity of 3½ to 6½ A/AUM, and usually classed as farming-grazing land.

Grama and western wheatgrass association, characteristic of the heavy clay loams, usually indicating farming-grazing or grazing-forage land; carrying capacity of 2½ to 4 A/AUM.

Grama and mountain sage association, characterized soils with moisture in excess of the amount required for grama grass alone; classed as farming-grazing land with carrying capacity of 3½ to 7 A/AUM.

Grama and matchweed association, generally found on the tillable grazing land, with carrying capacity of 6½ to 12 A/AUM.

Grama and valley sage association. Found on deep, well drained soils capable of cultivation; carrying capacity of 2½ to 4 A/AUM.

Grama and buffalo grass association, similar to grama grass alone, but indicative of crop failure during years of less than average rainfall; carrying capacity of 4 to 6½ A/AUM.

Grama, buffalo and western wheatgrass association, usually found on the farming-grazing or grazing-forage land; carrying capacity of 4 to 6½ A/AUM.

Western wheatgrass association, lower grazing value, with carrying capacity of 5½ to 6½ A/AUM.

Sagebrush association, classed as grazing-forage and grazing lands, with carrying capacity of 6 to 9 A/AUM.

Forest association, provided occasional grazing, but regarded as of low carrying capacity.

Saltgrass association, regarded as indicative of soils containing sufficient alkali to preclude production of dry land crops.

Findings of USGS Land Classification (1924)

CUSTER COUNTY

"Its surface consists of scattered remants of an old plateau that has been extensively dissected and lowlands established by aggradation along the larger drainage channels, with intervening areas of rough breaks and badlands.

"The largest drainage channels are those of the Yellowstone River and its two tributaries, the Tongue and Powder Rivers. Along these rivers at 100 to 250 feet above their channels are terraces or broad benches that represent former flood-plain areas of the rivers. These terraces have level to undulating surfaces which are separated from the present river valleys by sheer cliffs or fringes of breaks.

"The soil of the old plateau surface is chiefly sandy loam or clay loam. Some of the terraces have a shallow sandy-loam soil underlain by gravel, and others have a sandy or gravelly soil. The valleys have a clay loam or clay soil that is alkaline in places.

"The vegetation of the uplands is dominated by glue grama, which is associated with bluestem wheatgrass on the heavier soils and with needleandthread, prairie June grass, and threadleaf sedge on the medium and light textured soils. The clay-loam bottom soils support a blue grama and bluestem wheatgrass type, which is associated with silver sagebrush where the soil is of good depth and with big sagebrush or black greasewood where alkali is present. Small areas of pine hills occur that have a scattered growth of ponderosa pine with an undergrowth including the more prominent plains grass and weed species and small patches of little bluestem forming a conspicuous growth on the steeper slopes.

"The timber in these hills has little merchantable value and is used principally for posts or firewood. A few ash and boxelder trees grow along some of the intermittent creeks, and such shrubs as black chokecherry, Saskatoon serviceberry, silver buffaloberry, wild rose, and slender wheatgrass are prominent in coulees and low pockets that receive some extra moisture through surface runoff. Groves of cottonwoods occur along the larger streams. Annual precipitation is about 13½ inches, and the average length of the growing season is 130 days.

"The county contains an area of 2,415,000 acres, of which o percent has been classified as irrigated, 8 percent as farming-grazing land, 14 percent as grazing-forage land, and 77 percent as grazing land.

"Custer County is substantially a stock-raising area where the production of farm crops is carried on chiefly in connection with that industry. The grazing lands of the county will support about 25 animal units to the square mile during a normal season (2½ to 4 SA/AUM). The area is normally used as a spring, summer, and fall range. The average grazing season ranges from 7 to 10 months, but in open winters the more broken and sheltered lands may be grazed during the entire winter."

DAWSON COUNTY

"The Yellowstone River crosses the southeastern part of the county, flowing northward in a broad alluvial plain that ranges from 1 mile to 4 miles in width and is flanked on both sides breaks or badlands which extend to the west for an average of 6 miles and occur practically all of the county east of the river. Remnants of an upland plain occur here and there east of the river, and in the northwestern part of the county the surface is mainly level to rolling upland plains.

"The uplands have fertile sandy-loam to clay-loam soil. In the Yellowstone Valley the soil is alluvium of sandy silt loam with more or less gravel. In the breaks the soil is heavy clay or gumbo with scattered hardpan patches and in other places the soil is sandy or gravelly. The heavy soils contain more or less alkali generally where the drainage is poor.

"The vegetation of the uplands is a blue grama and prairie sand-reed type associated with bluestem wheat grass on the heavy soils and threadleaf sedge on the light soils. The heavy clay soils have a growth of big sagebrush and bluestem wheat grass with a few plants of black greasewood, shadscale saltbush, or Gardner saltbush where alkali has accumulated. In the river flood plains blue grama and threadleaf sedge are prominent, and silver sagebrush is found on deep soils that obtain extra moisture through flooding or subirrigation.

"The county includes an area of 1,509,000 acres, of which 1 percent is irrigated, 12 percent has been classified as farming land, 23 percent as farming-grazing land, 4 percent as grazing-forage land, and 60 percent as grazing land. The grazing lands in Dawson County have, in a normal year, an average carrying capacity of about 25 to 35 animal units to the square mile. Normally the grazing season extends from about April 15 to December 15, but frequently there is considerable winter grazing, especially in the breaks and other protected places. "

GARFIELD COUNTY

"Garfield County lies mainly upon the Missouri Yellowstone Plateau, a rolling to hilly upland of slight relief which includes large areas of tillable land traversed by intermittent creeks in relatively shallow channels.

"The county is bounded on the north by the Missouri River and on the west by the Musselshell River. These rivers have been incised below the upland plains to maximum depths of almost 1,000 feet. Adjoining their valleys and also along Dry Creek in the northeastern part of the county, the surface consists of rough breaks and badlands which range from 6 to 20 miles in width.

"The soil of the upland is mainly a fertile sandy loam or clay loam that is easy to cultivate. West of Cohagen, in T.15N., R.40E., are areas of heavy clay soils, a type that also occurs along many of the smaller stream bottoms. Along the southern edge of the county the soils are mainly heavy clay or gumbo. When dry, soil of this type is compace and hard, but when wet it is a sticky mass that can be cultivated only with difficulty. Much soil of this type is alkaline. In the breaks there has been little soil development, and the surface material is principally clay or disintegrated shale that has practically the same composition as the parent rock except for the removal of the more soluble material. Soils of a similar character occur at the base of the breaks along the river valleys. On the flood plains the soil is an alluvium comprising a mixture of sand, silt, and clay.

"The dominant vegetation of the uplands is a blue grama and green needlegrass type associated with bluestem wheat grass and threadleaf sedge as well as a scattered growth of prairie June grass, fringed sagebrush, and many herbaceous plants. On the heavy soils bluestem wheatgrass is the dominant growth, and on the light soils threadleaf sedge is prominent. The blue grama and green needlegrass type indicates the best farming soils. Heavy clay soils have a growth consisting of bluestem wheatgrass and big sagebrush. The gumbo areas in the southern part of the county have a sparse vegetative growth composes of scrubby big sagebrush and bluestem wheatgrass, with a more or less scattered growth of shadscale saltbush, Gardner saltbush, pricklypear, and black greasewood. In portions of the Musselshell and Missouri River breaks there are some ponderosa pines and a few scrub junipers, which are used locally for posts and firewood. Groves of cottonwoods grow along the banks of the Missouri and Musselshell Rivers beyond which are brush areas of big and silver sagebrush. Along the smaller streams are scattered clumps of ash boxelder, American elm, silver buffaloberry, and wild rose. The average annual rainfall in the county is from 12 to 15 inches, and the average length of growing season is 130 days.

"The county includes an area of 3,090,000 acres, of which only a small tract is under irrigation, slightly less than 1 percent is Missouri River bottom land, 14 percent farming-grazing land, 22 percent grazing-forage land, and 63 percent grazing land. The grazing lands of the county, in a normal year, have a carrying capacity of 25 animal units to the square mile. Although as a whole the ranges are utilized principally in the summer, the extensive break areas afford sufficient shelter from storms to provide valuable winter pasturage."

McCONE COUNTY

"The surface of McCone County consists for the most part of rolling to hilly uplands drained by numerous shallow intermittent stream channels. Beginning at a point on the south line of T.19N., R.43E., and extending northward to the Missouri River and from 6 to 10 miles east of the boundary of the county is an escarpment west of which the upland has been extensively eroded and the surface is rough and broken. A similar area of rough breaks occurs along the Missouri River, which forms the north boundary of the county.

"The soil in the northern part of the county is a till composed of loam with some loose rock debris. On the areas mapped as farming-grazing land the soil is chiefly a friable sandy loam that becomes somewhat heavier or lighter in texture in small areas. In the rough lands and breaks the clay-soil types prevail, although in patches these types are covered with more or less sandy material.

"The vegetation of the uplands is a blue grama and needleandthread type with bluestem wheatgrass prominent on the heavier soils and threadleaf sedge on the lighter soils. In the breaks big sagebrush and bluestem wheatgrass are dominant. The Missouri River bottoms are marked by groves of cottonwood near the river and valley and blue grama on the higher bottoms. Boxelder, ash, and willow are found along smaller streams, and in certain protected coulees there are thickets of wild rose, snowberry black chokecherry, and silver buffaloberry. The annual rainfall averages 13.5 inches along the Missouri River in the northern part of the county, but throughout the uplands it is approximately 15 to 16 inches. The average growing season is about 125 days along the Missouri River, and 115 days on the uplands.

"The county includes an area of 1,730,000 acres, of which 2 percent has been classified as Missouri River bottom land, 8 percent as farming land, 3 percent as farming-grazing land, 2 percent as grazing-forage land, and 52 percent as grazing land. The grazing lands of McCone County vary widely in carrying capacity, the better lands being capable of supporting 40 animal units to the square mile though the breaks in the western part of the county have an average carrying capacity of only about 20 animal units to the square mile. The county lies in a mixed farming and stock-raising region. In the western part of the county the rough surface limits farming to small areas."

PRAIRIE COUNTY

"Prairie County is crossed by the Yellowstone River, which divides the county into two almost equal parts. The river occupies a valley consisting in general of a flood plain bordered in places by a terrace developed during a former aggradation period of the river.

"The bottom land is bordered by breaks and badlands that separate it from rolling upland plains above the river valley. Here and there lignite beds are exposed; these have been burned in places, leaving clinker beds, or scoria, that are conspicuous features of the landscape.

"The soil of the uplands is principally a sandy-loam adjacent to the river, becoming heavier-textured loam to clay-loam toward the outer edges. The valley terraces have a sandy-loam soil which in places, especially near Terry, becomes quite sandy. Alkali is present in small areas of poorly drained bottom land. The normal annual precipitation is between 7 to 14 inches, and the average growing season is 130 days. The vegetation on the sandy-loam soils of the uplands consists principally of blue grama, needleandthread, bluestem wheat grass, and threadleaf sedge. Heavy clay soils support a bluestem wheat grass and big sagebrush type. Fringed sagebrush and broom snakeweed have a scanty stand in the uplands, especially on abandoned cultivated areas. The breaks support a mixture of various brush and grass species, little bluestem, prairie junegrass, and blue grama being the principal grasses.

'The river terraces or benches have a blue grama, threadleaf sedge, and plains reedgrass association. The bottom land supports blue grama and silver sagebrush for most part with groves of cottonwoods near the Yellowstone River and a few scrubby ash and boxelders as well as black chokecherry and silver buffaloberry along the small creek channels.

" The county contains an area of 1,104,000 acres, of which less than 1 percent has been classified as farming land, 37 percent as farming grazing land, 6 percent as grazing-forage land, and 56 percent as grazing land. The lands of the county in a normal year have a carrying capacity of approximately 25 animal units to the square mile."

RICHLAND COUNTY

" The surface of Richland County is mainly a rolling to hilly upland of moderate relief. The Yellowstone River crosses the southeastern part of the county, and the Missouri River forms its north boundary. These rivers flow in a broad alluvial flood plain which is bordered by an area of breaks that separate the bottom lands from the upland plains.

" Most of the soil of the uplands in the northern part of the county is a glacial till, mainly of sandy-loam or clay-loam texture but having in places more or less rock debris. Elsewhere the uplands have in general a sandy-loam soil which has been formed by weathering of the underlying sandstone. Along the tributaries of the Missouri and Yellowstone Rivers the soil is a heavy clay or clay loam.

"The alluvial soils of the river bottoms have a sandy-loam to clay-loam texture. The annual rainfall averages approximately 15 inches, and the normal growing season is 130 days. The vegetation of the uplands is blue grama and green needlegrass type, with bluestem wheat grass a very prominent species on the medium and heavier textured loams, and threadleaf sedge on the light sandy loams. Prairie june grass, fringed sagebrush, and scurfpea are other secondary species. In the small coulees or creek bottoms where heavy soils prevail bluestem wheatgrass, and big sagebrush are the dominant species, except in strongly alkaline areas, where seashore saltgrass is dominant. The river bottom has a blue grama and silver sagebrush type for the most part, with a fringe of cottonwoods near the river.

"The area of the county is 1,325,000 acres, of which 2 percent is irrigated, 3 percent is classified as Missouri River bottom land, 10 percen as farming land, 24 percent as farming-grazing land, 1 percent as grazing-forage land, and 60 percent as grazing land. The grazing land of the count in a normal year will support approximately 30 animal units to the square mile."

APPENDIX B - Section 5

DIGGING MONTANA DINOSAURS

By Shelton P. Applegate

Working under a permit issued by the Department of the Interior's Bureau of Land Management, the Los Angeles County Museum of Natural History has, for the past 6 summers, sent field parties into the Montana badlands to search for the remains of dinosaurs. These reptiles lived in the late Cretaceous about 80 million years ago. Their bones became buried in the muds and sands of rivers and lakes which today form the clays and sandstones of the famous Hell Creek "beds."

The collecting of dinosaur fossils in the western United States is a tradition that has been carried on by American museums since the latter part of the last century. Extensive collections of dinsaurian fossils can today be found at the American Museum of Natural History, the Peabody Museum at Yale and the Smithsonian Institute in Washington, D. C. The collecting of these fossils by the Los Angeles County Museum is in keeping with this tradition. It is the responsibility of our major museums to concern themselves with such undertakings when possible, for only a major museum has the staff, time, and money necessary to collect, prepare, and study our large dinosaurs. It is these institutions that can exhibit fossil dinosaurs to the best advantage.

Anyone who has seen dinosaur fossils in the Montana badlands will appreciate the fact that hundreds of bones are being exposed every year. The weathering of the bones causes them to fall to pieces and slowly wash away. In many parts of the west, exposed fossil dinosaur skeletons are often vandalized by curio seekers and irresponsible rockhounds who cut up dinosaur bone for jewelry. Yet it is only by collecting these remains and saving them that we can really gain an understanding of these fascinating beasts. A professional collecting team is therefore in essence a salvage operation and is not destroying, looting, or depriving the local people of these dinosaurs, but is saving them from destruction and placing them where they can be studied. Such collecting is, and should be, considered a definite conservation measure. Dinosaurs are a part of our western heritage not only from the viewpoint of world history, but also from the part they played in the early development and human history of the west. The names Marsh, Cope, and Hatcher have historical as well as a paleontological importance.

It should be realized that once an area has been collected by a professional team, and is later visited at intervals say of two or three years, it is possible for the trained eye to detect the bones of these large reptiles when they first come to the surface. This is a factor that results in better uneroded specimens which can improve our knowledge of specimens which were known before only by fragments.

The six Mr. and Mrs. William T. Sesnon, Jr. Expeditions to Montana lead by Mr. Harley J. Barbani have resulted in the collection of parts of three horned, plant-eating dinosaurs, Triceratops, one of which is already prepared for display and a cast replica sent to Japan. Three specimens of duck-billed dinosaurs, Trachodon, have been collected and prepared. The smallest is a 14 foot baby now on display. The largest Trachodon is 35 feet long. A small, less than 6 foot, meat-eater is now being studied and appears to be new to science. We have on display the skull cap of Troodon, the rare bone-head dinosaur. In our reference collection there are now several specimens of Champtosaurus, the crocodile-like but unrelated reptile. Two large fossil alligators found on these trips are being prepared in our laboratory. Collected with dinosaurs were the remains of plants, mollusks, and fish. Mr. Barbani is now preparing a small, 8 foot long dinosaur which was at first thought to be a "bone-head" but now is believed to be something else, perhaps the rare Thescelosaurus.

The most spectacular find has been the remains, though fragmentary, of three specimens of Tyrannosaurus rex, the "king lizard." The largest specimen has an almost complete skull that we are now mounting for study and exhibit.

Already several publications have resulted from these Montana trips. Dr. William J. Morris found new data concerning the beaks of the duck-billed dinosaur which has been published in our museum Contributions in Science. Dr. J. R. Macdonald published a popular article on the search for the king of the tyrant lizards in the Museum Quarterly. A similar article has been published by Mr. Walter E. Frisbie. A student of Dr. Morris, Allen Tabrum, has discussed the Tyrannosaurus finds before the Southern California Academy of Sciences and Mr. Ralph Molnar, a student of the University of California at Los Angeles is presently studying these king lizards in great detail. Certainly without the cooperation and help of the local Montana people we would not have been able to accomplish what we did. The Hell Creek beds are far from exhausted, and we certainly hope that we will have the chance to collect more dinosaurs here at a future date.

Literature

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Mr. Hardy Garbani and Dr. Reid McDonald of the Los Angeles County Museum, inspect progress on digging. Photograph, courtesy of Dr. David Whistler

APPENDIX C

Section 1	Range Vegetation Types
Section 2	Method of Rangeland Inventory

APPENDIX C - Section 1

Range Vegetative Types

From BLM Manual 4412.11a

"Vegetative Types. Vegetative types based on aspect which are first used in mapping an area into range types are the same as the 18 standard types established some years ago.

"1 - Grass. Includes grassland other than meadow and secondary meadow. Perennial grasses predominate and determine the aspect, although forbs and shrubs may be present. Examples of types are: grama-buffalo grass, bunch grass, wheatgrass-sedge, alpine grassland, and blue stem.

"Where it is desirable to distinguish short and tall grass from mid-grass, these ecological variations may be designated, 1S-short grass and 1T-tall grass.

"2 - Meadow. Includes areas where sedges, rushes and moisture-enduring grasses predominate. Two classes of meadows are recognized: wet meadows and dry meadows.

"Wet meadow or marsh is characterized principally by sedges and remains wet or moist throughout the summer. These shall be designated as W2.

"Dry meadow or flood plain is dominated by grasses rather than sedges and occur as moist meadow-like area or intermittent meadow, both of which become moderately dry by midsummer. These shall be designated as 2D.

"4 - Sagebrush. This type includes all untimbered lands where sagebrush or shrubby species of similar character predominate. The sagebrush lands are usually of different range values and different in season of grazing from the areas which are listed below under mountain shrub. Areas dominated by shrubby species of sagebrush, including big sagebrush (*Artemisia tridentata*) shall be classed as subtypes, as for example: *Artemisia filifolia*, *A. cana*, and *A. tripartita*. Other shrubby species such as *Chrysothamnus* should be designated as subtypes when they become dominate in sagebrush areas.

"This and the mountain shrub type which follows are sometimes difficult to distinguish from the grass and forb types when aspect rather than the dominant class of forage is used as the distinguishing characteristic. Sagebrush may form only 15 percent of the total vegetation of a type and still its aspect may be that of a sagebrush type.

"It may prove desirable, in a given region, to decide on a certain percentage of all the vegetation in the type, say 20 percent, as the minimum proportion of sagebrush that may be present if the area is still to be classified as a 4 type, providing, of course, it does not already have the aspect of some other type. The same will hold true of the mountain shrub.

"5 - Mountain shrub. This type includes all untimbered lands where mountain shrubs, excepting sagebrush or its subtypes, gives the main aspect to the type or is the predominate vegetation. Characteristically it occupies the transition zone of the lower mountain slopes, foothill, and plateau areas. Examples of subtypes are mountain mahogany, bitter brush, willows, ceanothus, manzanita, California chaparral, etc.

"6 - Conifer. This type includes all range in coniferous timber supporting grasses, forbs, or shrubs, either singly or in combination, except as provided under types 7 and 9. The forage may vary from a pure stand of pinegrass, or some other grass, to a pure stand of forbs or shrubs. It usually, however, consists of grasses, forbs, and shrubs, and the proportion of each species varies so widely that it is not thought advisable to attempt a division into types with distinct colors. These variations can best be represented by subtypes.

"7 - Waste. This type includes all areas of dense timber and brush which have no value for grazing domestic livestock or have such slight value that they cannot be used economically, owing either to denseness of standing or down timber or sparseness of forage growth. Large areas of very sparse forage, unless within easy reach of a better type, shall be classified as waste because of the impracticability of running stock over so large an area to get such a small amount of feed.

"This type also includes other waste areas not strictly in timber of brush and not barren, but so rough or inaccessible as to make their future use improbable.

"The subtype designations generally encountered in this type are as follows: 7T-waste in dense timber; 7D-waste in down timber; 7B-waste in brush; 7R-waste areas where rocky character prevents use; and 7I-permanently inaccessible areas. Principal species of timber should be shown by symbols.

'For any 7 type which is or can be used by game animals, the type number is modified by adding after the "7" designation the number (in parentheses) of the aspect vegetative type involved. This combination type number will indicate value for game forage and habitat.

"8 - Barren. This type includes all areas on which there is no natural vegetation, or practically none, including intermittent lake beds, saline flats, active sand dunes, shale, rock slides, lava flows, etc. Areas which have been denuded by overgrazing or other causes should not be confused with areas naturally barren, nor should areas containing only annuals for a part of the year be shows as "barren" although these may be without vegetation for the remainder of the year.

"9 - Pinon-juniper. This type includes pinon, juniper, pinon-juniper, and digger pine. The character of the range in this type as regards location, grazing capacity, and management is sufficiently distinct from the conifer type to justify a separate color. The forage may vary from a pure stand of grasses, forbs, or shrubs to a combination of any two or all. This variation can best be shown by subtype designations.

"10 - Broad leaf trees. This type includes all range in deciduous timber. The combination of grasses, forbs, and shrubs, and the proportion of individual species, will vary as in other types.

"The principal subtypes which will be encountered are: aspen, cottonwood, oak, birch, alder, ash-elm, etc., when they occur in tree form.

"13 - Saltbush. This type includes areas where the various salt desert shrubs of the *Atriplex* genus form the predominant vegetation, or give the characteristic aspect. There is sufficient significant difference in the range value and the use of saltbush areas to justify their separation from other desert or semi-desert shrub types.

"14 - Greasewood. This type includes areas where greasewood (*Sarcobatus*) is the predominant vegetation or gives a characteristic aspect. Usually this type occupies valley floors subject to overflow during flood periods or areas underlain with groundwater at shallow depths where the soil is more or less saline. It is sufficiently differentiated from other desert shrubs to justify an exclusive type.

"17 - Half shrub. This type includes areas where half shrubs constitute the dominant vegetation or give the characteristic aspect.

'Half shrubs are semi-woody perennials of low stature such as *Aplopappus*, *Gutierrezia*, *Artemisia frigida*, *Eriogonum wrightii*, etc. They commonly consist of a woody caudex from which herbaceous stems are produced that die back annually. These genera are sufficiently distinctive in habitat and of wide enough extent in certain localities to justify a separate designation.

"18 - Annuals. This type includes areas in which annual forbs or annual grasses constitute the dominant vegetation. Both transitory stages and semipermanent conditions should be included in this type as for example: russian thistle, downy chess (*Bromus tectorum*), and desert forbs. The plant symbols used will be sufficient to indicate the predominant species present."

APPENDIX C - Section 2

Method of Rangeland Inventory

The Missouri River Basin Studies uses the ecological method of range inventory. This system describes the rangeland's potential production in terms of amount and kind of forage. Present production can then be compared to the potential.

The ecological method of range classification depends on two essential concepts: the range site, and that of the climax plant community.

Range Sites

Each Range site is described in terms of soil depth, texture, parent materials, Ph salinity, stoniness, slope, exposure and organic matter, topography, precipitation, and other influences. Range sites are so stable as to be nearly permanent, due to the relatively unchanging character of such component elements as topography, degree of rockiness, etc.

Plant Communities

The regional climate, modified by each range site's environment, develops characteristic and unique plant communities. When the range site and its plant community are modified in some way, such as an increase of soil fertility or a decrease in light intensity, some plants may be favored more than others. One plant species may replace another species; or one plant community may replace another community, and this second community in its turn may be replaced by a third. There is a series of stages moving towards a climax community. The final stage, the climax, persists as long as there is no change in the environment.

Within a particular climatic region, the stages of all plant communities tend towards one uniform climax plant community. For example, the tall grass prairie (big bluestem, switchgrass, yellow indiangrass) occurs on limestones, granites, clays and shales, floodplain deposits, sands and calcareous marls. But this development is often affected permanently by a local environment. Such a local environment is used in the concept of a range site.

The range site can limit vigor and productivity of individual plants and composition of the plant communities. Saline or shallow soils may have plant communities that are entirely different from those found on undrained soils. Such exceptions are the basis for a range site.

Application

A guide for use by the range inventory field crew is prepared, as illustrated below. A guide describes both the range sites and plant communities for such large physiographic areas as the Montana Glaciated Plains covering one-third of the state. Descriptions of the range sites are usually easy to prepare. The descriptions of the climax plant communities are more difficult.

Field Guide

DECREASERS		INCREASERS (By Range Sites)	Maximum Percent by Dry Weight Produced Annually in Climax														INVADERS (Less than 2½% in Climax)
			Sa	Sv	Sy	Si	Cy	TSy	TSi	TCy	SwC	SwG	SwL	SwN	Ps	DC	
Elci	Orhy	Agsm	5	30	30	d	d	d	d	d	d	d	d	d	d	d	Annual Plants
Spgr	Poca	Stco (1)	25	20	45	40	-	45	40	-	-	d	d	d	d	-	Phpr
Sppe	Puai	Spcr	10	5	10	5	-	10	5	.	-	15	10	5	5	-	Popr
Caca	Pudi	Kocr	5	5	5	5	5	5	10	10	5	5	5	5	10	-	Sepa
Cain	Sedge decr.	Camo	-	5	5	5	10	5	5	10	5	5	5	5	10	5	Musq
Elca	Forb decr.	Mucu	-	-	-	-	-	5	10	10	5	10	10	10	5	-	Hoju
Brma		Bogr	10	5	15	15	10	20	20	15	15	20	20	20	20	-	Arlo
Bran		Buda	-	-	-	-	5	-	-	5	-	-	-	-	5	5	Cael
Atca		Pose	-	-	-	5	5	-	5	5	5	5	5	5	5	5	Crsq
Pavi		Sihy	-	-	-	-	-	-	-	5	5	5	5	-	5	5	Cusa
Spai		Sedge incr.	5	5	10	5	5	10	10	10	10	10	10	10	5	-	Taof
Poar		Dist	-	-	-	-	-	-	-	-	-	-	-	-	5	-	CIRS
Agsp		Forb incr.	5	5	5	5	5	5	5	5	5	5	5	5	-	-	Arco (2)
Agsu		Eula	-	5	5	5	5	5	5	5	-	d	d	d	d	d	Amar
Agin		Atnu	-	-	-	5	5	-	5	5	10	-	5	-	10	-	CHRY
Agtr		Artr	-	-	-	-	5	-	5	5	5	-	-	-	5	5	
Anha		Atca	5	-	-	5	-	-	5	-	-	-	-	-	-	-	
Ange		Save	-	-	-	-	5	-	-	-	5	-	-	-	5	5	
Ansc		Conifers	-	10	-	-	-	-	-	-	5	-	5	5	-	-	
Bocu		Other woody increasers	10	5	5	5	-	5	5	-	-	-	5	5	-	-	
Hemo		Musq	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

The climax plant community for a range site is found by searching for protected or relatively undisturbed rangeland. The plant community of the least disturbed range sites is regarded as representing the vegetative potential. In addition, grazing district records, experiment station ranges, scientific literature and historic accounts are investigated. The evidence from any one source is not regarded as conclusive - all must be considered.

Because the range sites vary, each plant species has a broad range for its portion of the total plant community. For example, range sites with similar soils and topography may vary in forage production because of differences in annual precipitation.

Although the plant composition may be temporarily changed by drought, grazing, fire, or farming, range sites are permanent; their climax plant communities, if disturbed, will re-establish. Sometimes the disturbance is so drastic that the range site is permanently changed. Farming, for example, may be so prolonged as to change the original range site by excessive soil erosion. A new range site with its altered potential is then described. (Range sites are named from the physical character of the site, i.e., Badlands, Saline Uplands, etc.)

Range Condition

In practice, the range condition is found by listing the relative quantities of plants. This is compared with the climax plant community of the range site. Differences are described in four classes: "Excellent," "Good," "Fair," and "Poor," denoting the degree to which the present plant community varies from the climax plant community. (Note: The descriptions are not ideal, and could lead to misinterpretation of the inventory's results. For example, "Badlands" are poor because they produce very little forage, but they are usually in "Excellent" ecological condition. These descriptive class words are so widely used in range management literature, that their use is retained despite their shortcomings.)

Changes from the climax plant community are stated by percentages because the animals harvesting the forage are selective and exhibit palability preference. A range site grazed by sheep loses weeds and browse plants, becoming more of a grassland. Cattle use results in less grass and more weeds and brush. Antelope and deer remove more of the shrubby species. Such changes from the climax are expressed better by percentages than by unwieldy narrative description.

Volume production, the amount produced by each species, is estimated to the nearest 5 percent for present and climax plant communities. This includes all photosynthetic surfaces. Pricklypear, for example, will have succulent pads many years old, which compete for light and water. On the other hand, only the leaves and the current annual growth of twigs is estimated for sagebrush.

Plant Community Reactions in Determining Range Conditions

The climax community's vegetation is divided into decreaser, increaser, and invader plants. These groups represent the plant's reaction to heavy grazing pressure. Under continued heavy use (1) decreaser plants slowly disappear and (2) increaser plants replace the decreasers. Increaser plants have a limit in the climax community; they can spread into available space only after the decreaser plants dwindle away. Under heavy grazing, low value increaser plants usually seize territory faster than those of higher value. This limit on increaser plants in climax vegetative communities is the key in making calculations. Using the plant guide for the range site, a limit is found for each increaser plant, any excess to that limi is disregarded.

The following field tablet page illustrates the computations used to arrive at a numerical value for range condition.

Range Site & Condition Write-up
(Ecological Site Method)

Date July 10, 1971

Plot No. S-2 Examiner John Smith

T 18N R 49E Sec 14 P.M. Mont. ⑤

1 Annual Bromes CAREX Agsm F 7.1 45%
Tcy VIII C 1-1-1 3 F 2 FYZ 3

Present Composition			Climax
Species		%	% Usable
Grasses	Bogr	10	10
	CAREX	15	10 ②
	Agsm	10	10 ①
	Stco	5	
	Calo	T	
	Agsp	10	10
	Brte	20	③
	Brja		
	Fuoc	5	
	Pose	10	5 ②
	Hoju	T	
Forbs	Plan	5	③
	Arfr		
	PSOR	5	③
	Weeds		
Shrubs	Arca	T	
	Artr	T	
	YUCC	T	
Total		100%	④ 45%
			Condition

Steps in Calculation

① Total the percent of all decreaser plant species. (Decreaser plant species are in the guide for each range site.

② Total the present quantity of increasers, But only to the limit for each species in the climax community. Any excess is disregarded. (Increaser plant species and their limits are in the guide for each range site.)

③ Disregard all invader species (annuals and noxious weeds.)

④ Total the amounts of decreaser plants plus allowable quantities of increaser plants.

⑤ Record the total and determine adjective for condition.

0 to 25 percent - "Poor"
25 to 50 percent - "Fair"
50 to 75 percent - "Good"
75 to 100 percent - "Excellent"

APPENDIX C

Results

Management is not based on high range condition scores; it depends on the kinds of plants found on the range. Spring range with annual grasses might be far from the original plant community for the site, yet meet the exact needs for economic management. The ecological system of range inventory uses the original plant community as a benchmark to which the ever-changing rangelands can be compared. Goals can be envisioned and results forecast by the use of the two concepts, range sites and climax plant communities.

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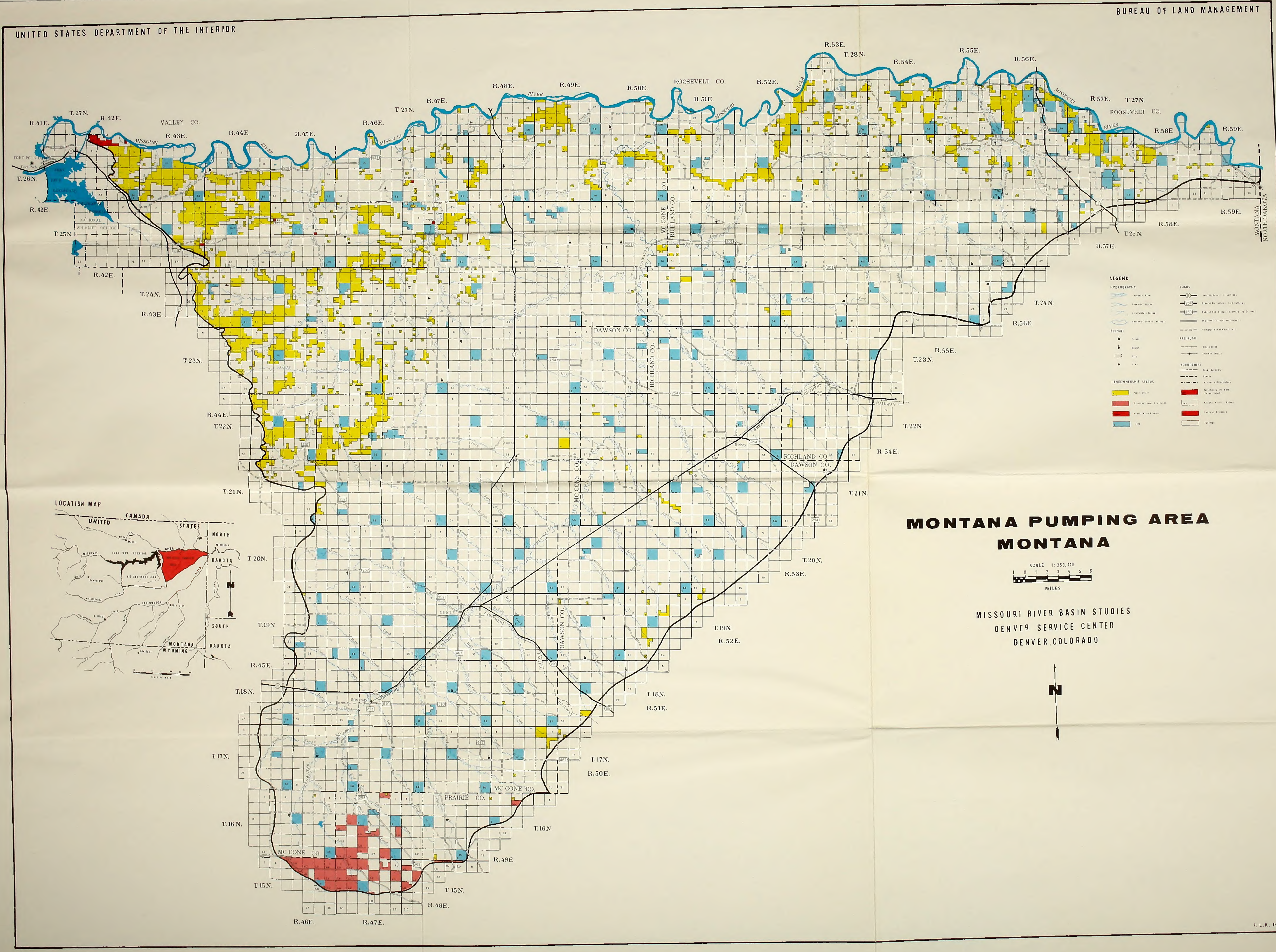

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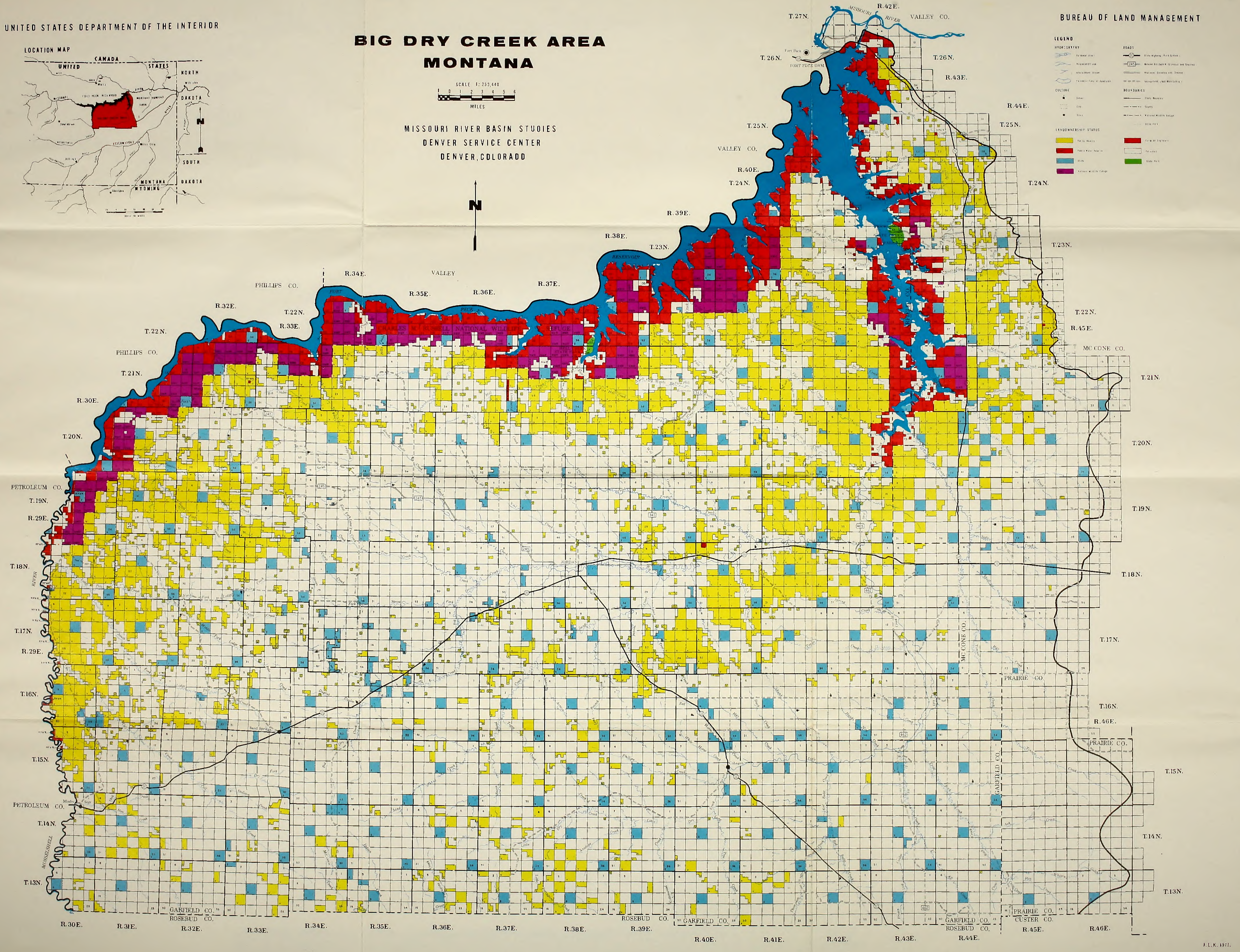

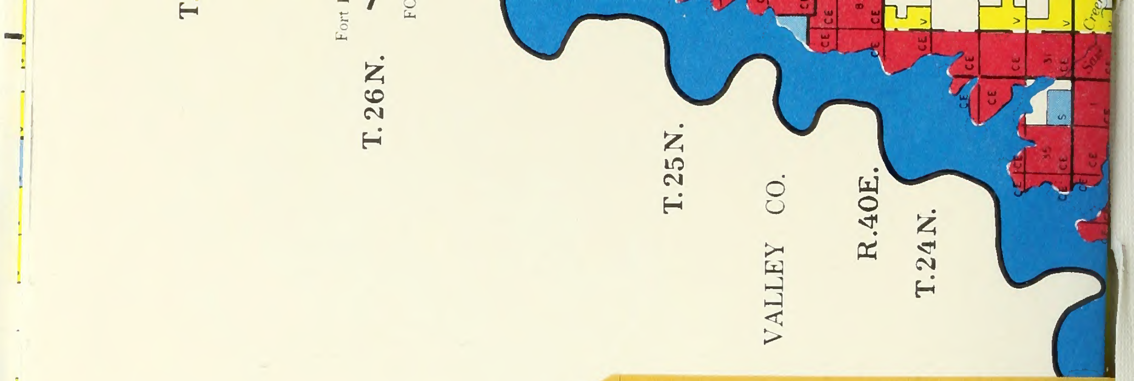

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